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MARCH 1947 · 25 CENTS

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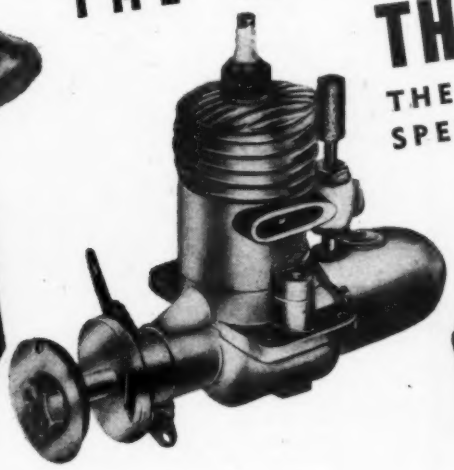

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MODEL AIRPLANE NEWS

JAY P. CLEVELAND
Publisher

MARCH 1947 VOL. XXXVI No. 3

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IN ONE OF the most significant papers in recent aviation history, Dr. Luis W. Alvarez, winner of the Collier Trophy, stated that the use of atomic energy for aircraft propulsion would be doing an easy thing the hard way. Backing up his conclusions with hard facts, Alvarez stated it would be technically feasible to propel an airplane by atomic energy, but in his opinion it will probably not be attempted. Major objection, he pointed out, is the fact that an atomic energy aircraft would have to be three or four times as large as the Consolidated B-36. Although the pilotless guided missile overcomes the shielding requirements, Alvarez concluded: "If you read in the papers some years hence that an atomic powered rocket has been sent to the moon, you can at least be sure its designers chose atomic power only after many misgivings, and that the decision was based not on the attractiveness of this new energy source but only after the realization that it was fantastically difficult or expensive to do the job with chemical propellants." Although Alvarez' award of the Collier Trophy was for his development of the Ground Control Approach system of blind landing, he is better known in recent years as a nuclear physicist.

EARLY SUCCESSFUL test flights of the Martin 202 and rapid acceleration of its production has discouraged at least two, and possibly three competitors in the feederliner arena. Boeing discontinued development of its Model 417 and Lockheed shelved its Model 75 *Saturn*. Although Consolidated is continuing construction of its prototype Model 240, its future is not clear according to company spokesmen. Obviously the Martin 202 has scored a clean victory in the first round.

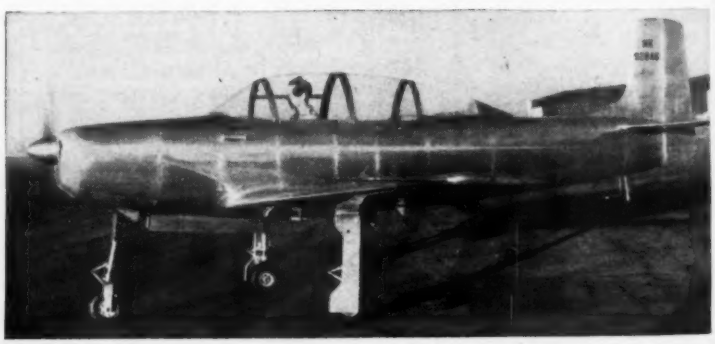
EVIDENCE OF AAF's appraisal of the Republic XP-84 *Thunderjet* fighter is the award of a contract for construction of 500 of them at a cost of $25,000,000. The *Thunderjet* thus becomes the successor to Lockheed P-80 *Shooting Star* as AAF's second service jet type. Republic is also at work on a later jet type, the XP-91, on which no details are yet available.

THE GIANT *Menasco* gas turbine engine, reputed to be the most powerful ever built, is now undergoing preliminary test stand operation. Although details are still lacking it is known that the monster engine is being developed under an AAF contract for $2,402,700.

FOR THE FIRST time in aviation history a lightplane company has produced 1,000 airplanes in a single month. Piper

(*Turn to page* 6)

(Above) New Navy jet fighter designed for carrier use is the North American XFJ-1. Although details are scarce it is known to have 38 ft. span and length of 33½ ft. (Below) The *Streak*, new all metal tandem two seater for the private flier to be produced by Aero-Flight Aircrapt Corp. Top speed is expected to be over 170 mph with 85 hp *Continental* fuel injection engine using ordinary 73 octane auto gas



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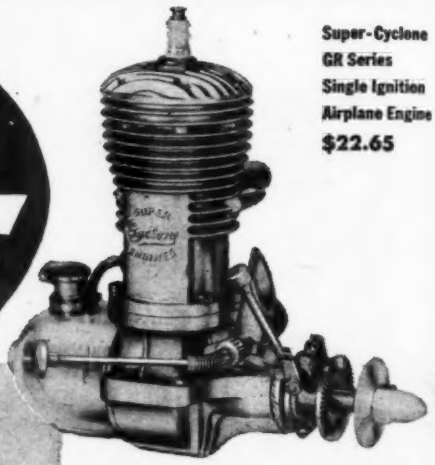

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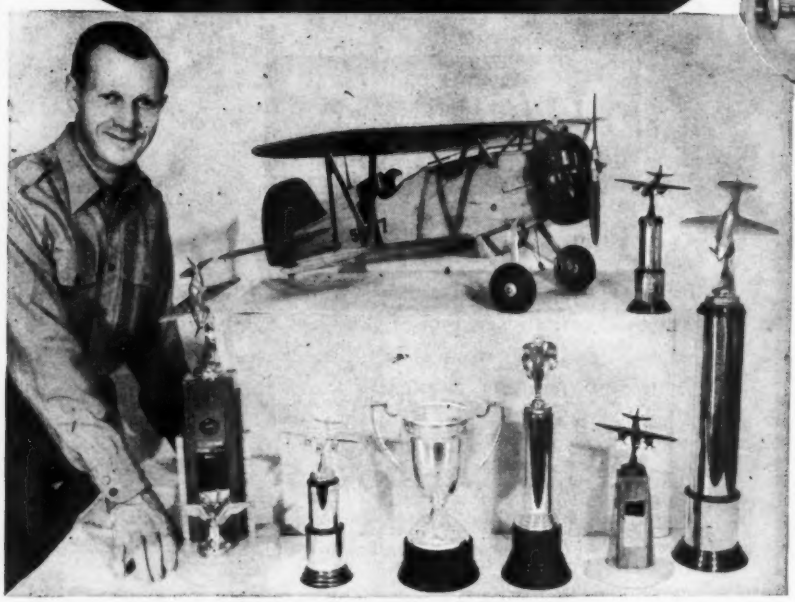

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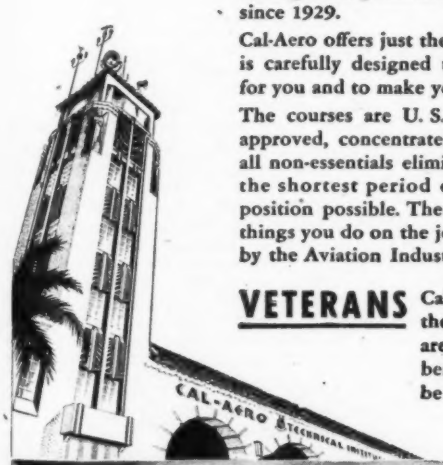

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hung up the record with 1105 planes, with Aeronca running a close second with 1006. Observers believe, however, that this is about the peak in the lightplane production picture with orders slowing down to a trickle through the winter. Production this spring will be shifted to new postwar designs with accompanying large reductions in production.

WITH THE first postwar year's impact of sales on the personal aircraft industry now waning, that old bugabood "price increase" is moving in throughout the industry. Republic announced a price tag of only $3,995 for its famed *Seabee* initially but this was raised during the middle of last year to $4,495. Now comes the latest bad news: an increase to $6,000 for the neat amphibian, considerably over the financial heads of Mr. Average Pilot. Another high priced four-placer is the Beech *Bonanza*, tagged at $7,345. The North American *Navion* remains at the $6,000 level, depending on equipment. The market for these planes, however, has shifted noticeably from the private owner to the "executive" class of ownership by companies and medium sized industrial plants.

DETAILS ON THE Martin XP4M-1 are available and reveal it as a four engine landplane with only two engine nacelles. Each nacelle contains a Pratt & Whitney R-4630 *Wasp Major* engine with propeller in the front and a General Electric I-40 turbojet unit in the back. The giant craft is of conventional design with remote-control turrets throughout the fuselage. Top speed is 398 mph. It has a gross weight of 81,887 lbs. and a service ceiling of 16,400 ft. according to reports. It has already been test flown.

NOW THERE is an answer to the old saw about "everybody complains about the weather but nobody *does* anything about it." General Electric Co. recently demonstrated a method of doing something about the weather. A recent demonstration involved the dropping of dry ice pellets into a heavily-laden cloud with the astonishing result that it immediately began to snow! The cloud was three miles long and at a critical temperature. The addition of the ice cubes served to cool the cloud just enough to change its moisture into snow. AAF is coordinating the experiments under contract in an attempt to provide fog and cloud dispersal methods for use in local area around airports.

EVIDENCE THAT Grumman intends not only to continue but to expand its amphibian business comes from the recent announcement that an enlarged version of the *Mallard* is now under construction for the Navy. The new amphibian, designated XJR2F-1, will have an 80 ft. wingspan and carry 16 passengers. The *Mallard* has a span of 66 ft. 8 in. and carries up to 10 passengers.

WITH INCREASING combat aircraft speeds has come problems in bomb design. Army Ordnance Department's Ballistic Research Laboratory at Aberdeen Proving Ground is conducting supersonic wind tunnel tests on bomb designs suitable for use with supersonic bombers or bomb-carrying fighters. Col. Leslie E. Simon, director of the Laboratory, says existing bombs and bomb shapes would prove highly inaccurate if dropped from supersonic aircraft. Research work in the supersonic tunnel at Aberdeen, Md., has already developed shapes for these new supersonic bombs.

AAF HAS completed preliminary tests on use of "sand bullets" for dissipating the acceleration of parachute-dropped equipment and supplies. The device consists of a U-shaped tube with the open end pointed downward. Sand is inserted in both ends with a powder charge in the middle of the bend. As the parachute load nears the earth the charge is set off and the sand is blown out of the two legs. The theory of the device is, as in jet propulsion, that the momentum of the sand will exert a force upward on the load, serving to slow its descent a moment before it hits the ground. The tests proved that a proper relationship between size of the load and size of the charge will practically stop the load in midair.

IT HAS BEEN revealed that Russia is developing several helicopter designs, one of which is now flying. This is the *Omega*, a twin-rotor design of I. P. Bratukhin, a newcomer in the Russian aircraft picture. His design is very similar to the McDonnell XHJD-1, which is now known officially as the *Whirlaway*. The *Omega* is powered by two radial engines and is said to have a top speed of about 75 mph. Other designs have been developed by M. I. Mill and N. I. Kamov.

CERTAIN DETAILS are now available on the Curtiss XP-87 "all-weather" fighter. It resembles the famed British *Meteor* in general outline with the turbojet units located in streamlined nacelles in the wing. It is designed for operation in poor weather conditions and contains complete radar equipment. It is also known as the XA-43 when fitted with bombs and special attack equipment.

AAF IS pushing development work on the ramjet engine with recent designs in the flight test stage. The tiny but powerful engines are mounted on the wingtips of fighter planes and are used for emergency bursts of power. Two fighters have been tested to date. The Bell XP-83 was recently destroyed while undergoing flight tests with ramjets installed. A fire started in the fuel system. Numerous successful flight tests have been completed to date with ramjet engines installed in the wingtips of a North American P-51 *Mustang* at Wright Field.

THE FIRINGS of captured V-2 rockets at White Sands Proving Grounds have undergone continuous improvement and the latest launching, No. 17, carried the missile to an altitude of 114 miles and produced a speed of 3,716 mph. The presence of captured German scientists at White Sands, including many who were responsible for design and development of the missile, was only recently announced. This latest firing was characterized by the release of metal slugs fired by a shaped charge. It is hoped the slugs attained a high enough acceleration to escape the earth's gravitational field. Should this prove to be the case, the slugs would orbit about the earth as satellites and future study of outer space by powerful telescopes will be required to confirm their existence.

FIRST PRODUCTION model of the Martin XBTM-1 *Mauler* dive-bomber is nearing completion and the production line is filling rapidly. The new design, to be known as the AM-1, involves numerous changes developed from flight tests on the experimental model.

WHAT MAY well become the forerunner of a vast family of guided missiles of the future has been announced by NACA. It is the *Tiamat*, a 600 lb. rocket-powered missile with a speed of 600 mph. It is a "step" rocket with initial thrust of 7200 lbs. being delivered by a "booster" assembly in the tail. After the

(*Turn to page* 88)

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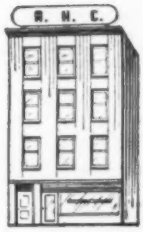

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- 12", 13" .60
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- Tip Jacks Set .60
- Plug Gauge Set .15
- Alum. Prop Spinners 5/8", 20c; 3/4", 30c; 7/8", 75c; 1 1/2", $1.00; 2", $1.25; 2 1/2", $1.50; 2 3/4", $1.75.
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- Bamboo paper—white, green, blue, each .10
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- Celluloid Sheet .10
- Austin Tank .50
- Winston Tank .75

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Model Airplane NEWSLETTER

by AL LEWIS

ONCE AGAIN international attention is focused on the Wakefield competition and Wakefield models. According to Frank Zaic, well known designer and experimentalist, and chairman of the AMA Wakefield committee: "The Wakefield Cup meet is fairly certain of being conducted in 1947. Rubber situation is improving and enough time has elapsed since the end of the war to give model builders all over the world a a chance to prepare their entries. The usual date of the Wakefield meet is the first Sunday in August."

That is certainly good news. The cup has been shelved, so to speak, since 1939 when Dick Korda of Cleveland won it at Bendix, N.J., in a hotly contested competition that saw an English and Canadian team competing in person, and other countries were represented through proxy flyers.

The problem of selecting an American team now faces us. Mr. Korda, by virtue of

his previous victory, is automatically accorded a position on the team. But four additional members must be recruited. Mr. Zaic points out that the date of the finals makes it necessary that the American representatives be selected not later than the end of June. Just how the finalists will be selected is under discussion among Academy members.

"There are two possible methods," advises the committee's chairman. "One is to divide the country in five regions and have each region determine its man. Second method would be to allow more regions and/or more flyers from each region and have this greater number of flyers enter a national elimination meet. By the first method we would obtain the best regional flyers. The second method would give us the best representation of the country.

"Just how regions would be determined is also open to suggestions. It may be according to population, number of members in the Academy, or according to actual number of entries in the eliminations.

"It has been suggested that a $1 entry fee be charged to the entrants, the entire proceeds to be used by the region to help the finalist go to the Wakefield meet or national Wakefield eliminations.

"It is the chairman's opinion that Akron is the logical place for the actual Wakefield meet, while the eliminations can be held elsewhere. It is hoped that elimination details will be ready early."

(*Turn to page* 10)

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at Wichita, Sept. 1946

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Class B Winner

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Arden P-099	$18.50	Delong .30	19.50
Arden B-099	21.50	O.K. B-.29	15.50
Arden .099 Flight Chassis	13.50	Madewell—"49"	18.00
		O.K. Super-60	18.00
Arden B-199	25.50	Ohlsson 60	18.50
Bantam .19	18.50	Pacemaker "59"	24.95
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(all prices less coil and condenser)

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E-5 Solderless Plugs	2 for 25c
E-6 Connector Lugs	3 for 5c

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I-2 3/8" Spark Plug Gaskets	2 for 5c
I-3 Spark Plug Connectors	2 for 5c

Gas Model Fittings

G-1 Landing Gear Washers for 3/32" Wire	12 for 5c
G-2 Landing Gear Washers for 1/8" Wire	12 for 5c
G-3 "J" Landing Gear Bolts	4 for 25c
G-4 Wheel Collar & Hub	25c pair
G-5 Bolts & Nuts, Class A, 2-56, 3/4" long	12 for 20c
G-6 Bolts & Nuts, Class B-C, 4-40, 1" long	12 for 20c
G-7 Bolts & Nuts, Class B-C, 4-40, 1 1/2" long	12 for 20c
G-8 No. 2 Lock Washers	12 for 10c
G-9 No. 4 Lock Washers	12 for 10c

"Controliner" Fittings

C-1 Elevator Hinges	4 for 10c
C-2 Swivels, Class A	15c pair
C-3 Swivels, Class B, C	20c pair

Rubber Powered Model Fittings

R-1 Propeller Washers, 1/8" O.D.	24 for 5c
R-2 Propeller Washers, 1/4" O.D.	24 for 5c
R-3 Cupped Washers, 3/16" O.D.	12 for 5c
R-4 Cupped Washers, 1/4" O.D.	12 for 5c
R-5 Ball Bearing, Washer	10c
R-6 Thrust Bearing, Small	3 for 5c
R-7 Thrust Bearing, Large	2 for 5c
R-8 Wire Prop Hook, Small	3 for 5c
R-9 Wire Prop Hook, Medium	2 for 5c
R-10 Wire Prop Hook, Large	5c each
R-11 Rubber Tensioner Spring	2 for 5c
R-12 Prop Folder Hinge, Complete Set	20c
R-13 3/8" Face Bushing dia.	5 for 5c
R-14 7/8" Face Bushing dia.	3 for 5c
R-15 Eyelet, 1/16" I.D. x 3/16" long	12 for 5c
R-16 Eyelet, 3/32" I.D. x 3/16" long	12 for 5c
R-17 Eyelet, 1/8" I.D. x 3/8" long	12 for 10c
R-18 Brass Nose Plug, Small	3 for 5c
R-19 Brass Nose Plug, Large	2 for 5c

Reg Pink Fuel
The record breaking non-corrosive, non-gumming methanol fuel. $1.25 quart.

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Balloon type

7/8" dia.	25c pr.	Streamline type	
1 1/8" dia.	30c pr.	1 7/8" dia.	50c pr.
1 3/8" dia.	35c pr.	2 1/8" dia.	60c pr.

HECO-VOIT Air Wheels
Inflatable-streamline wheel available again

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(*Continued from page 8*)

The suggestion has come from other quarters that the entire preliminary qualifying and actual running off of the Wakefield finals be held under the sponsorship of a national organization. The National Exchange Club has been prominently mentioned. With Exchange units throughout the country already active in model meet promotion, it would be a relatively simple and logical procedure. Exchange clubs banded together in state units could hold a state elimination competition and send meet reports to AMA headquarters in Washington, D.C.

Four top place men could be selected on basis of their performance compared to second place winners. Those with greatest difference would be selected and sent to finals to compete with foreign teams. These four plus Mr. Korda would be the American representatives.

We know that the Metropolitan Council of Exchange Clubs in Detroit is most anxious to undertake the sponsorship of a top meet. Why not give them the privilege of underwriting the Wakefield affair? They have the backing and the interest. It is estimated that approximately $10,000 would be needed to pay the expenses, both travel and housing, of foreign teams once they reached this country. We feel that figure a little high, but better to figure too much than too little. Given ample notice to prepare, plus governmental support, it is thought a number of teams would be here "in the flesh" for the international blue-ribbon event.

Maybe you have some thoughts on the subject?

* * *

REPORTS have reached us of a hot shot control line speed job powered by three jet engines. Rumor has it built something

like the *Black Widow* with two jets acting as tail booms and a third as fuselage. We shudder, especially at the noise, but confess that the thought is intriguing. Does any reader have some dope on such a contraption, if indeed there is one?

* * *

HARD AT WORK to build a strong state organization for the advancement of model aviation is Frank Bushey of Hartford, Conn. Mr. Bushey, a school teacher, is an ardent model flyer himself and has done much to promote new interest and support for aeromodeling activities. As New England coordinator for the AMA, Mr. Bushey is striving to develop a Connecticut Chapter that would serve as a model for similar groups throughout the country. Not long ago he sent out a questionnaire to all leaders, clubs and individual flyers whose names and addresses were available. Object was to test their reaction and have their suggestions for a state group.

Tentatively he expects the setup to function as the Connecticut state chapter of the Academy; its members would all be AMA license holders residing in the state. Purpose of the organization would be to further development of model aviation in Connecticut, New England and the nation; to aid and assist in handling all meets within the state; to carry out elimination and state championship competitions; to set up controls necessary for safe and progressive growth of the activity; to assist other organizations in conducting meets and club work; to voice the opinions and needs of Nutmeg modelers in local, state, regional and national matters.

Certainly a commendable and needed program. Modelers throughout Connecticut are urged to contact Frank Bushey at 210 Euclid Street West, Hartford 5, regarding this council.

(*Turn to page 94*)

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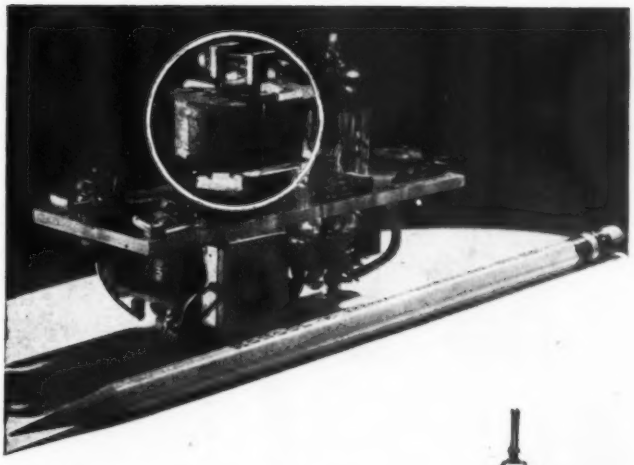

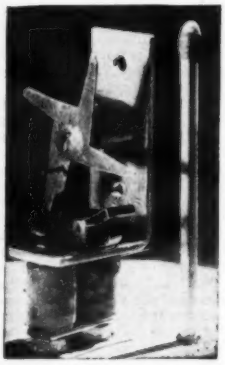

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Weight—1 ounce

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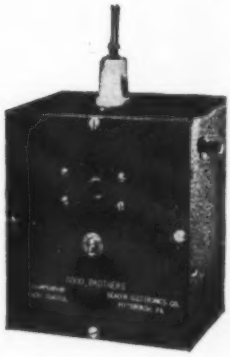

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Size—Approx. 4" x 5" x 6"

Range—Approx. 2 miles

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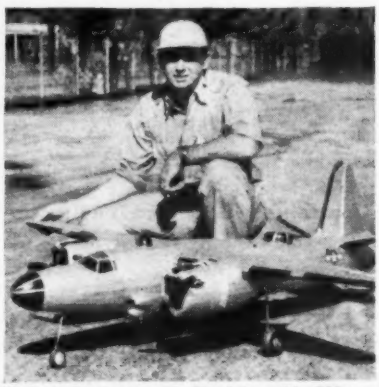
WEST COAST TIPS

by JOHNNY DAVIS

HERE we are with another season of contest work and excitement on the calendar. In the next few months many a trusty motor and plane will bite the dust, to say nothing of the "bites" that "prop fingers" will get. All of this is by way of starting our whereabouts of old West Coast model builders column again; also whereabouts of old contest champions, etc.

Last year about this time we had what we thought was a pretty good list of outstanding boys who would be pretty tough to beat in the usual run of contest competition. After all, they had been the outstanding boys from the war years and it was logical to suppose that for at least a year the stay-at-homes would beat the boys who went away.



Herbert Sturtevant of Glendale, with *Ohlsson*-powered 6 ft. B-26; after an eventful life the ship burned up following a motor backfire

But what happened? Everything! The stay-at-homes went away and the went-aways came home to beat the sox out of the old records and stunts. Also, the younger generation bounced up and made the big boys take two looks before grabbing the prizes.

To start the parade, the returning veterans just about took over the speed events. Don Newberger, former flight officer AAF, and Wally Wallick, crew chief AAF, took over the Class C speed crown. Another vet, former PFC Keith Storey, teamed with Newberger to garner the Class B hardware. In Class A the younger generation, in the form of Keith Conrad and Norman Morgan, gave Les MacBrayer (minus his partner Wellman Green) a tussle at every meet. Another rambunctious junior, Ray Benskin, son of popular Clarence Benskin, the former Class C champion, gave the boys thrills in all classes.

Last year, "Hoppy" Hopkins, Jack Schauble, Frank Greene, Virgil Clark and Bob Smith were the men to beat. But somehow as the season wore on they seemed to drop back, not on merit necessarily, but more probably due to the old business of making a living. Hoppy in particular had to spend a lot of time on the road in connection with his oil business. Frank Greene was just about swamped with paper work on contest boards and the like. Bob Smith turned to the stunt and precision event, and Jack Schauble left the state for a visit to Oregon. Virgil Clark was also swamped with his prop manufacturing business, and his partner Granger Williams spent the year in Japan. So the throne was vacant.

But not for long. In the early summer last year Don Newberger, just two weeks out of the army, set a new Coast record of 125 mph in the Class C event. He then proceeded to win the next six consecutive contests, culminating in the Western Open and proceeding to the Nationals. His running mate, Wally Wallick, placed second behind Don in all these contests until the Nationals. There he finally nosed Don out after the boys had spent three hectic days and nights trying to figure out the screwy atmospheric conditions that prevailed at Wichita. Since that time Wally has been beating Don about two times out of three. However, between them, regardless of who wins, the two top spots have almost always been Mr. N. and Mr. W.

In the Class B event, Keith Storey first startled everybody by hitting 105.36 mph with an old beat-up *Tiger* at the Santa Anita contest. Shortly after that Don Newberger (there's that man again!), with a *McCoy 45* (a test engine not in production at the time), came along to win the B event with 112.80 mph. However Keith Storey continued to try to beat him and jacked his *Tiger* job up to 108.46 mph before the season was over. Actually, more credit should be given to Storey for his *Tiger* job than the *McCoy* job of Newberger's since the engines are not comparable for power, the *McCoy* being a specially designed racing engine and the *Tiger* a general purpose engine.

The clean lines of Storey's little black job would surely have earned him a first place notch against all competition had he been in a position to acquire a *McCoy* for last year. Now that the *49* is in production Storey will be a hot contender for this year's honors.

***Flying Bat Wing* with *Super Cyclone*, very successful and highly maneuverable flyer, also by Herb Sturtevant**

In Class A, Keith Conrad had a little gold-painted modified *Sharpie* that really batted along. Several times he clocked over 100 mph with a *Torpedo* for power. We believe that with a little more experience under his belt Keith is going to cause

(*Turn to page 14*)

Several products of E. J. (Joe) Weathers lined up at a West Coast meet—*Pacificoaster* in foreground and 7 ft. *Westernor*

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plenty of trouble this year. Keith would do well to change his stance while flying for record; many experts have commented on the fact that he costs himself a mile or two an hour in speed because he bends over the way he does. With a little change, he may be this year's hot man to beat.

There's another man who shouldn't be sold short. Name's Tony Naccarrato. Yeah! Old Pappy himself! Tony almost killed himself trying to keep up with his speed job while flying it on a pylon. He ended up flying it back over his shoulder. Two minutes more gas in the tank and his *Torpedo* job would have lapped him! But Tony stayed with it and now holds the Class III record at 102.72 mph, which isn't bad speed for a Class IV or Class V engine.

Norm Morgan is another one of the Class A hardware fiends and has a reputation for getting maximum power out of small engines. He used a homemade rotary valve *Ohlsson 23* last year and hit anywhere from 90 to 101 mph in contest work. He also had an *Ohlsson 19* rotary job, which turned in speeds up to 84 mph. These times are considered tops on the Coast for any engine size under .30 cu. in. dip. With the new factory rotary which O. & R. just put on the market, Norm will really be hard to beat. He has the most beautiful small job we have ever seen.

As for the stunt and precision events, there has been a general upswing in the quality of individual performances but little change in the winners' column. Davis Slagle continues to lead the Juniors and is not likely to be headed unless another momma and poppa become as ambitious with their youngster as are Mr. and Mrs. Slagle.

The *Burbank Club* and the *Lockheed Club* have usually taken home first places in Precision and Flying Scale. The *Burbank Club* has probably the largest collection of precision and stunt experts of any club on the entire coast: J. A. "Madman" Yates, Bob Palmer, Don Gulotta, Ed Abacherle, Alphie Schwarzlose, Willard Hellman and Davy Slagle head the list of a fine assortment of precision flyers.

The *Lockheed Club* is famous for its scale experts: especially Ced Galloway, Gerald Borden and Lee Lord. Recently the Lockheed boys have branched out to speed work and a great deal of team flying. The entire *Snafu* team, famous for the large number of planes flown in the same circle (once they flew nine in the same circle) belongs to the *Lockheed Club;* and Ed Lansberg, member of both the *Lockheed Club* and the *Snafu team,* is showing great promise as an upside down pilot and precision flyer.

* * *

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Well, Easterners, enjoy yourselves. You haven't got much more time!

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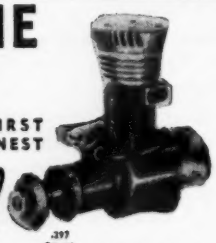

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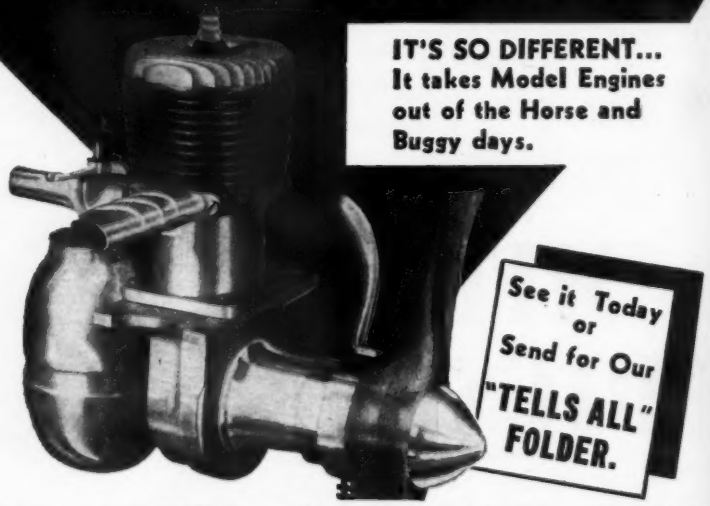

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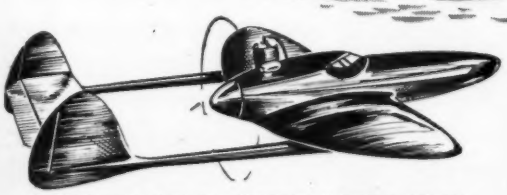

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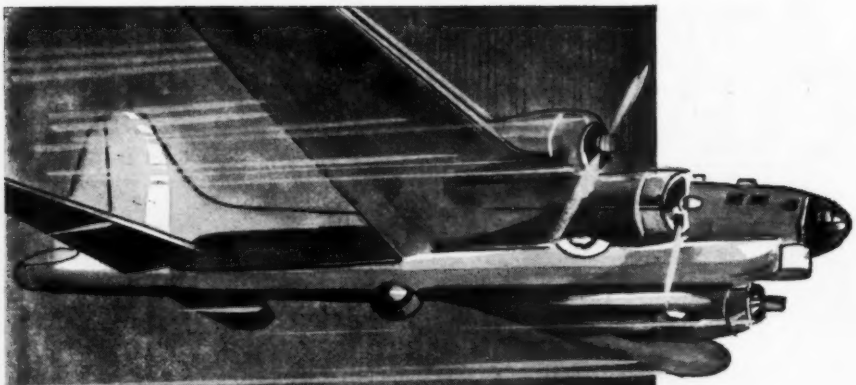

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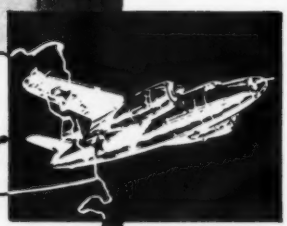

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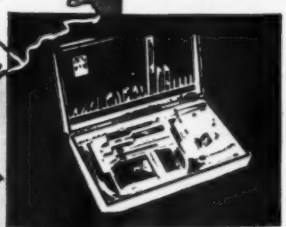

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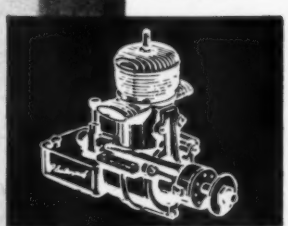

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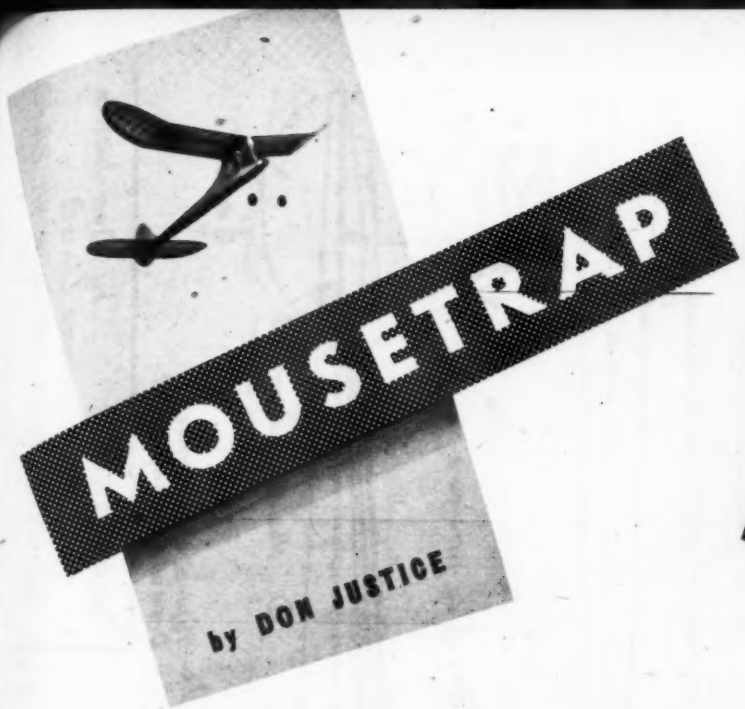


MOUSETRAP

by DON JUSTICE

Though not so-named because it snaps onto thermals, *Mousetrap* nevertheless will do just that

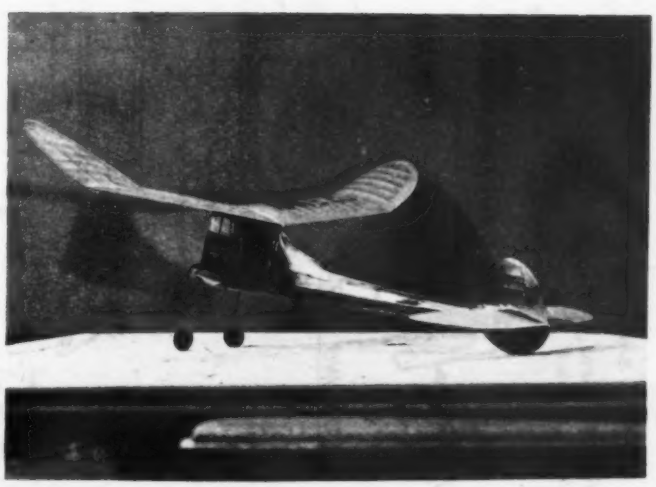
DO YOU crave a change from pylons? Well, here is *Mousetrap*—it will perform with the best of pylons but doesn't look like one. The author doesn't intend to enter into the old pylon-versus-shoulder-wing controversy, being more or less an old pylon man himself. But *Mousetrap*, with a completely cowled-in motor, has an advantage in streamlining yet doesn't give up any stability or ability to handle high-powered motors. It has a good contest record, too, having made at least one out-of-sight flight at every contest it entered. Its best time to date is a 31 min. official turned in at Clarksburg, W. Va., on a perfect flying day.

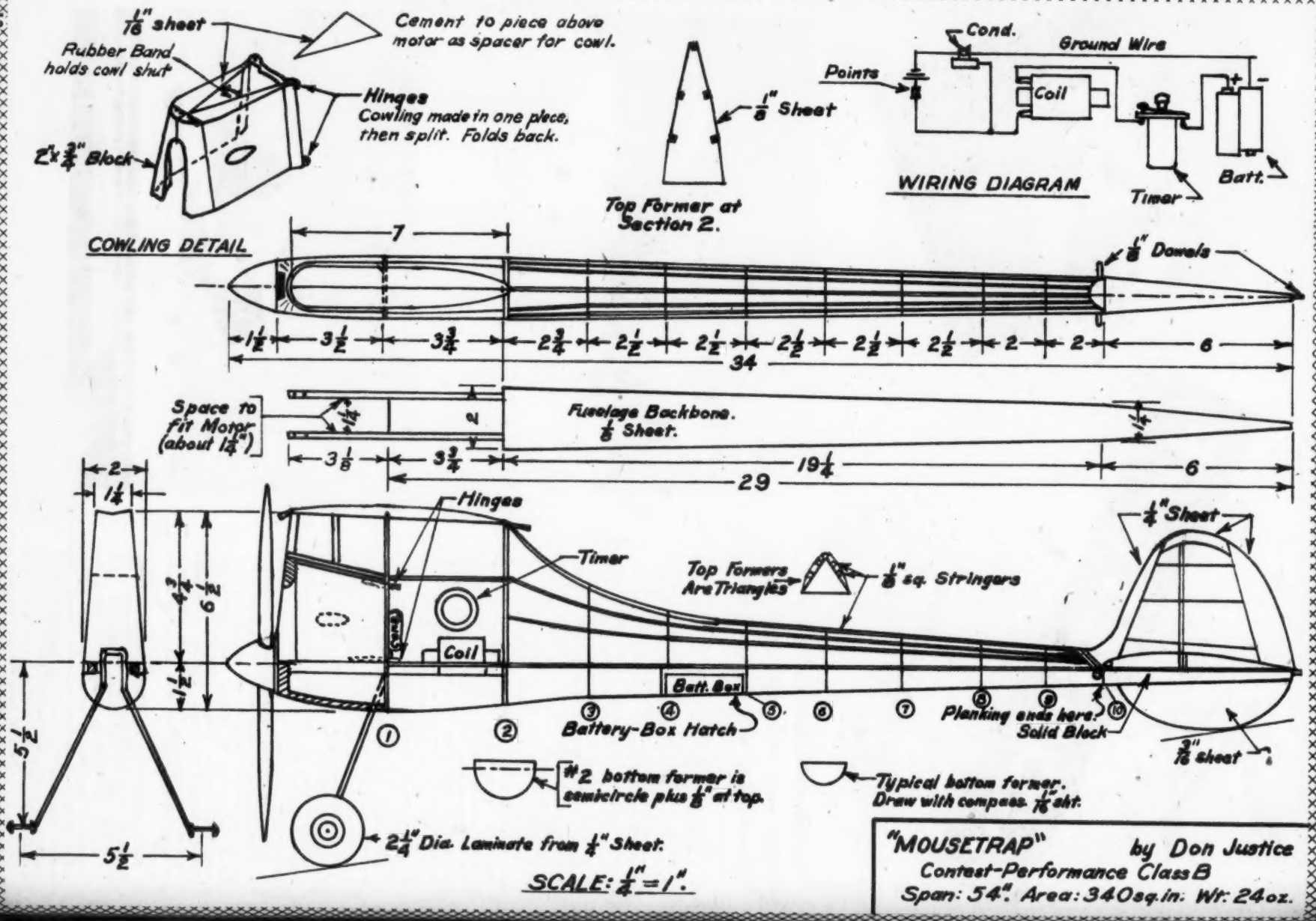
Mousetrap is a high performance Class B contest model. It was designed for 0.29 cu. in. motors and is as compact and light as the rules allow. For this reason it is not an ideal model for just sport flying, as most motors will not turn slowly enough to keep it from climbing pretty high, and its glide makes it the prey of most any old thermal. If you want a sport model it is advisable to substitute larger wheels and beef up the construction so as to add weight.

You might be interested in the whys and wherefores of the design. The author wanted a good contest model, and the design was worked out from this viewpoint. The most important factor, then, is stability. A model that is stable will handle the power of the most hopped-up motor, will be easy to adjust, and will perform well consistently. Stability requires a balanced arrangement of the aerodynamic forces. Generous horizontal tail area gives *Mousetrap* a good margin of longitudinal stability and permits the Center of Gravity to be located back toward the wing trailing edge. This CG location helps the glide by causing the ship to assume a fairly high angle of attack in the glide, yet the ship keeps its nose down in the climb without use of downthrust.

Spiral stability was built into the ship by striking as good a balance as possible between the amount of dihedral and size of the rudder. With the CG in the location shown on the plans, the ship has no tendency to tighten up into a turn in either direction under any amount of power. The author would like to point out here that spiral stability is a combination of lateral and directional stability. The location of "Center of Lateral

(*Turn to page* 46)

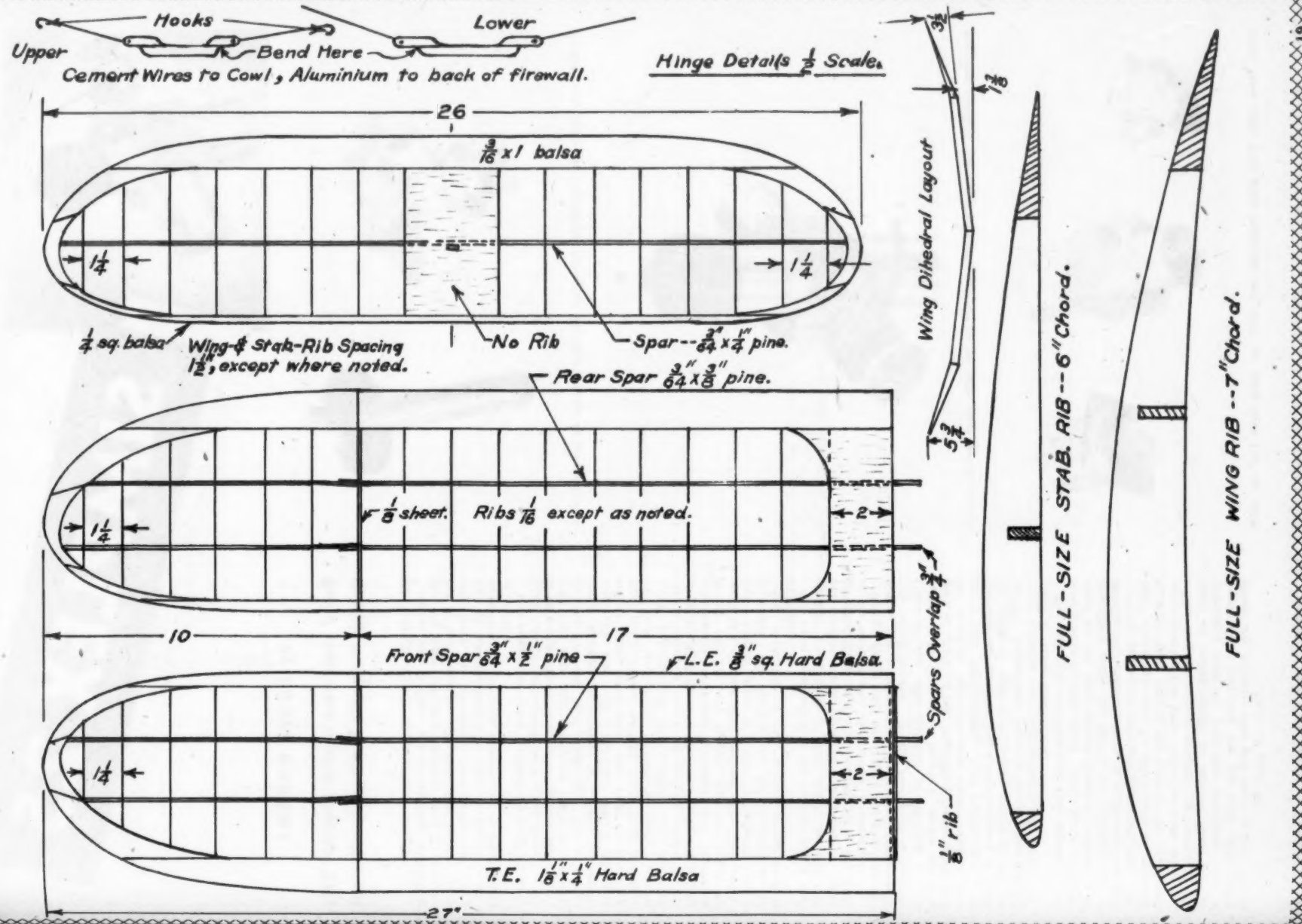


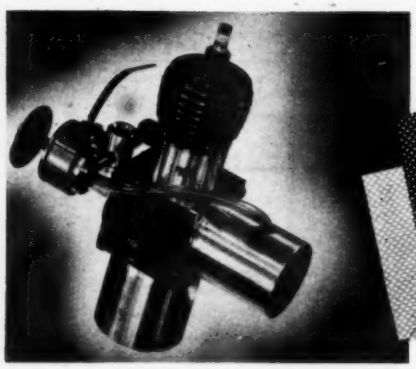


"MOUSETRAP" by Don Justice

Contest-Performance Class B

Span: 54". Area: 340 sq. in. Wt: 24 oz.

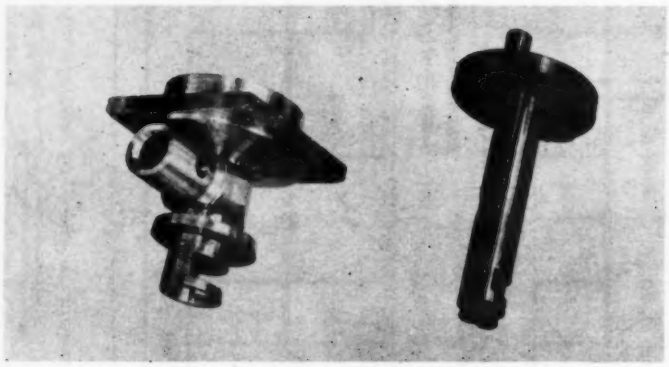

Hooks
Lower
Upper
Bend Here
Cement Wires to Cowl, Aluminium to back of firewall.
Hinge Details 1/2 Scale.
26
3/16 x 1 balsa
1/4
1/4
1/4 sq. balsa
Wing-& Stab-Rib Spacing 1 1/2", except where noted.
No Rib
Spar--3/64 x 1/4" pine.
Rear Spar 3/64" x 3/8" pine.
1/8 sheet.
Ribs 1/16 except as noted.
2
10
17
Front Spar 3/64" x 1/2" pine
L.E. 3/8" sq. Hard Balsa.
Spars Overlap 3/4"
1/8" rib
T.E. 1/8" x 1/4" Hard Balsa
27"
Wing Dihedral Layout
3 1/2
1 1/8
5 3/4
FULL-SIZE STAB. RIB--6" Chord.
FULL-SIZE WING RIB--7" Chord.



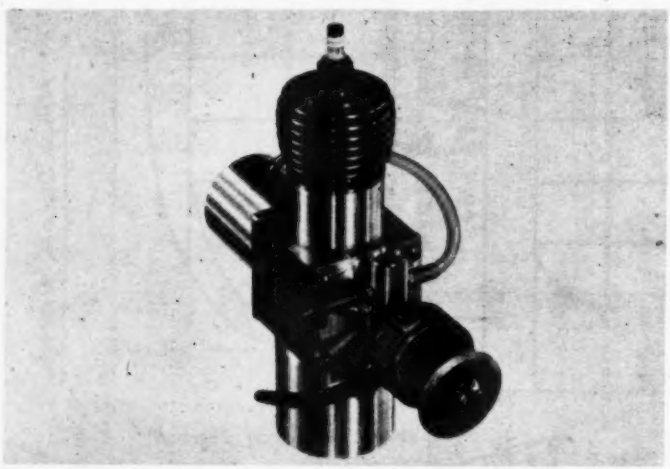
SIMPLEX 25

by LOUIS GARAMI

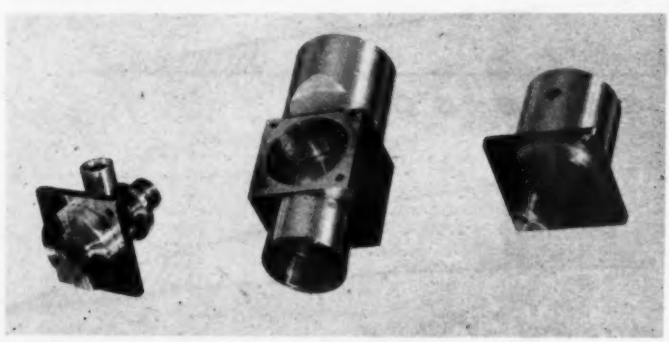
Build your own model engine! This design is simple but highly efficient



Finished front plate with crankshaft; the latter has been polished to reduce friction



The large chucking stud below crankcase was left on for these views and for testing



These three parts, front plate, crankcase and tank, are made from 1¼" sq. stock

IN PRESENTING construction details for a model gas engine, we are trying something that we hope will be of interest to a large number of our readers. We feel that besides those who have the necessary tool equipment, there will be many others who have access to it, possibly in trade schools, garages, or at their places of work.

The engine we have worked up is of the simplest design consistent with good results. We have purposely avoided entirely the use of castings and also any processes such as welding, brazing or even hard soldering. The only machine equipment required is a small screwcutting lathe, and such a machine with 6" swing, of which many have been sold even by the large mail order stores, will be more than adequate. The lathe accessories necessary, aside from the usual cutters and tool holders are: four-jaw chuck, tailstock chuck for drilling, plus a variety of standard drills, and two end mills. A milling attachment, tool-post grinder and three-jaw chuck will be very helpful and will speed the work greatly, but they are not absolutely essential. A drill press will also be helpful; but, if necessary, all drilling can be handled in the lathe, especially if the milling attachment is available.

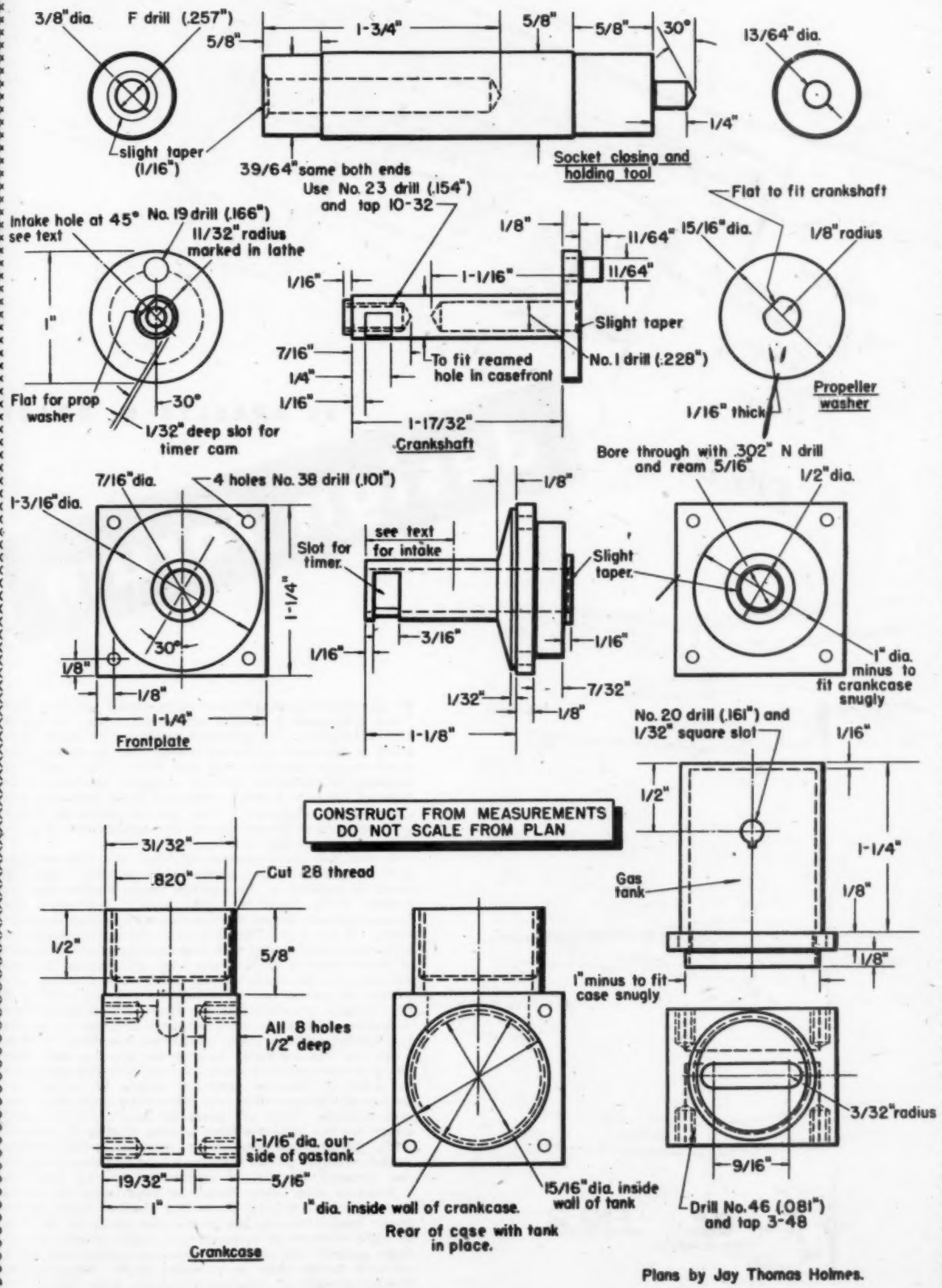
We have assumed that the builder has a reasonable knowledge of lathe operation and will not explain such elementary subjects as cutter grinding which are best learned from literature on the subject and from actual experience.

Before going into the actual construction details, a few comments on the design of the motor may be of interest. In the first place a medium Class B size was selected as offering a good compromise between a larger C motor which is easy to work on but requires a larger lathe, and the small A, very cute but necessitating a jeweler's skill for building. Our motor then is at the halfway mark; it has a displacement of about .25 cubic in. with a bore and stroke of .688" or 11/16". It has been found to be easy starting and very reliable, and will swing a 10" prop of 8" pitch at about 6500 R.P.M.

The materials used are such that wearing qualities should be very good. Some parts are hardened by the very simple Kasenit process to be described later; the piston and cylinder are of *Meehanite*, which material is easily worked, long wearing and much stronger than cast iron. The 24ST aluminum used for other parts is very easy to work with and in the case of the crankshaft main bearing has been found to wear well.

The original engine weighs 7 oz. complete. At least an ounce could be shaved from this by trimming material from the crankcase and its front plate, thinning the gas tank and cutting down the cylinder fins and head a bit. We do

(*Turn to page* 68)



Plans by Jay Thomas Holmes.

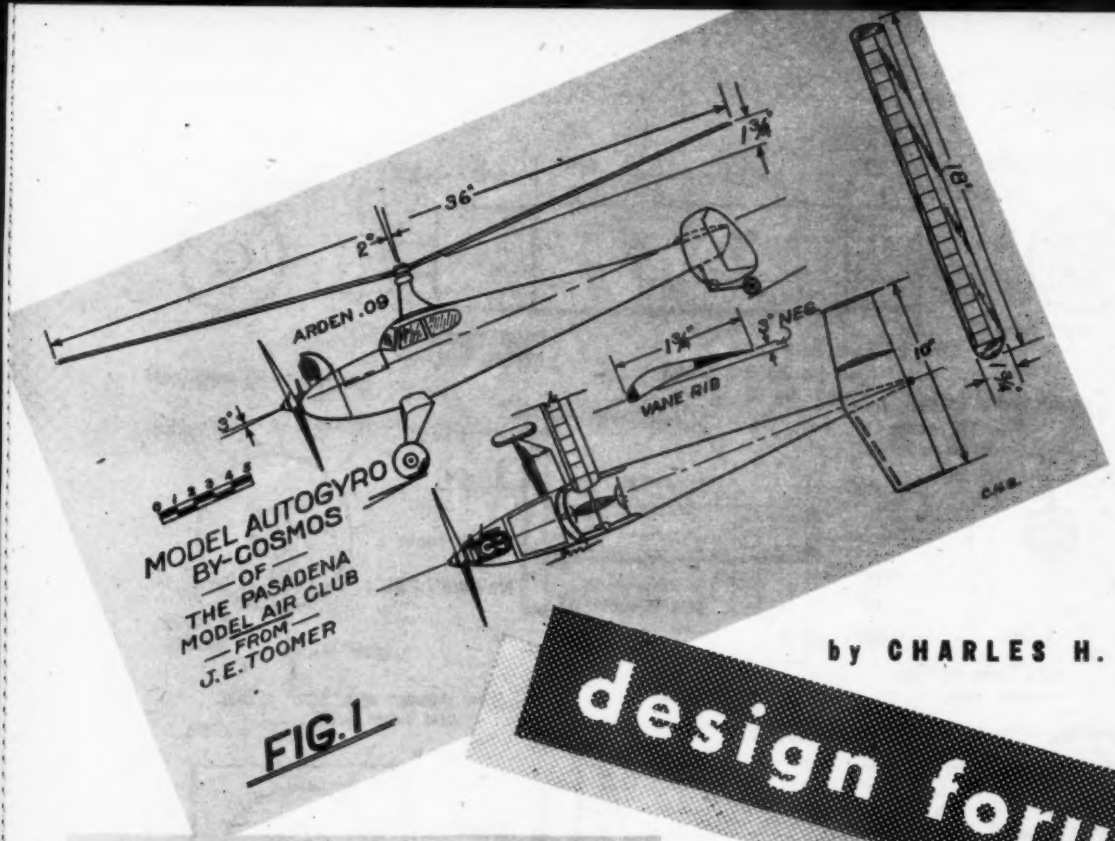


FIG. 1

design forum

by CHARLES H. GRANT

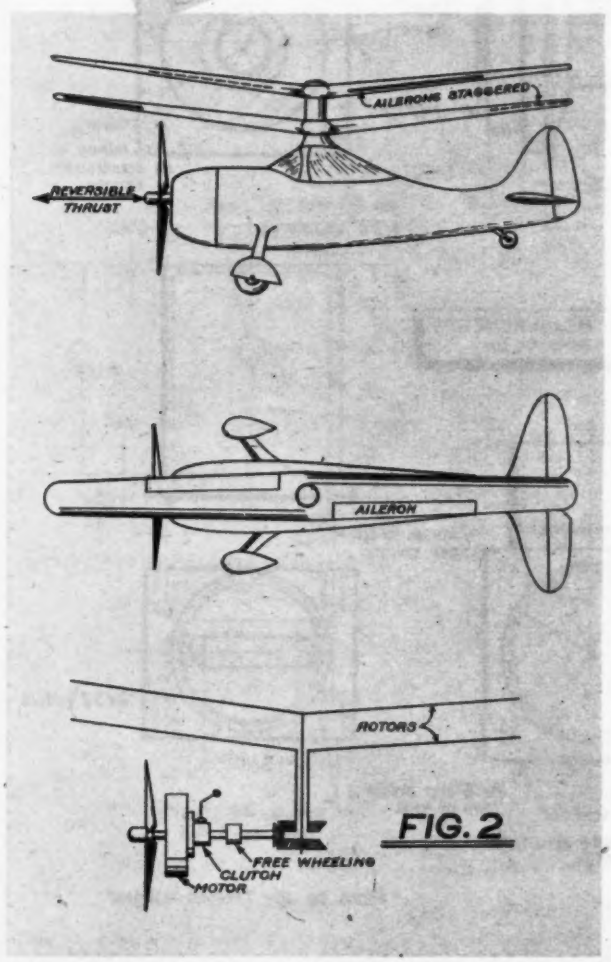


FIG. 2

IT IS surprising indeed that more model builders have not attempted to design and build model autogyros and helicopters. Perhaps most modelers are more interested in the sport of flying models than in carrying on research and experimenting with them. The number of attempts to construct and fly autogyro models can be counted on your fingers, especially those powered with gas engines. Apparently they are restrained by a lack of fundamental knowledge or the application of aerodynamic knowledge to this type of craft.

It was not until pioneer builders of ordinary gas-powered planes had established basic practical rules that could be applied by the average model builder that gas models really began to "take hold". Autogyros and helicopters may follow the same pattern in their development. If so, it will be necessary for a few ingenious pioneers to experiment with and develop practical models of these types of craft before they will appear in large numbers on the model flying field. Gas-powered airplanes, in comparison to autogyros (to say nothing of helicopters), are child's play. There are twice as many unknown factors to consider and arrange in proper relationship as there are in the more conventional models.

We say this assuredly because for the last two years we have carried on intensive experiments with autogyros in order to discover practical means of overcoming torque, gyroscopic effect and other tricky actions of this type of craft. After two years we have reached a point where we can graduate from towline models to powered craft. All previous experiments were made with towline models without power because it was felt this would be the simplest method of application to the problem.

However, after many months of experiment we realize that it is more difficult to build a towline model than a power model because the pull of the string on the ship in flight changes in intensity and angle relative to the flight pattern and center of pressure, adding one more variable factor than in powered craft. Nevertheless, towline models of wingless autogyros were flown successfully over a period of twenty months.

(Turn to page 54)

WORLD WAR I

by ROBERT C. HARE

SINCE the introduction of "World War I" two years ago as a regular feature in MODEL AIRPLANE NEWS the aircraft described have been, without exception, designs of foreign origin. This situation has been brought about by the fact that not one airplane of original American design was used at the battlefronts of Europe. Because of an aeronautical backwardness, manufacturers in the United States had to be content with producing training planes which were admittedly as good as any in the world. But combat types flown by American pilots overseas were exclusively of foreign origin, including the several hundred Liberty powered DH-4's manufactured in this country and put on active service in France.

Out of a chaotic condition in the American aircraft industry which lacked up to date aircraft design, good engines, production facilities and know-how, came one little single seat pursuit trainer that may be remembered long after more romantic combat types are forgotten. That plane is the Thomas-Morse S-4-C. Still spoken of reverently as "Tommy", the S-4-C represented to student pursuit pilots all that was to be expected of a single seat fighter by way of feel and appearance plus a lot of gentleness that some combat types lacked.

The status of "Tommy" in development of World War I military aircraft was peculiar in that this was the first single seater designed from scratch expressly for the purpose of training pursuit pilots. Foreign governments with more advanced equipment used obsolete or underpowered service types for pursuit training. The position in the U.S. was such, however, that not even obsolete pursuits existed for use in this highly specialized type of training and the type had to be created.

Background

The S-4-C was a product of Thomas-Morse Aircraft Corp. of Ithaca, N.Y., successor to the pioneer Thomas Brothers company of Hammondsport which was formed in 1910. Only two years earlier, William T. Thomas graduated from Central Technical College, London, as a mechanical engineer. To satisfy his dreams of contributing to aviation, Thomas came to America with his brother, Oliver W. Thomas, and the two went to work for Glenn Curtiss. Soon the brothers formed their own company and began construction of a long line of excellent airplanes and engines.

By 1913 the Thomas brothers had built and successfully flown nearly a dozen types ranging from passenger carrying pusher biplanes and tractor monoplanes to steel hulled flyingboats. That year the company acquired the services of B. D. Thomas, a King College, London graduate who had engineered for Vickers Ltd. and Sopwith Aviation Co. in England before joining Curtiss in

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The Thomas-Morse S-4-C scout trainer powered by 100 hp Gnome engine

Small size of S-4-C is apparent. Note aileron cranks in cantersection

This "Tommy" has an 80 hp Le Rhone rotary and a full coat of war paint

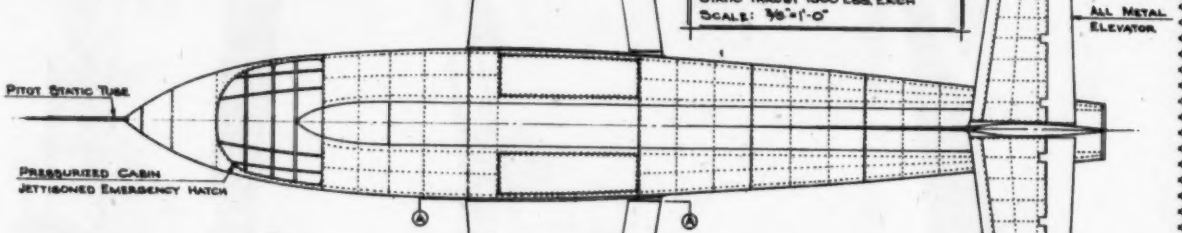
S-4-C used in Hollywood has altered tail shape to imitate Sopwith Camel

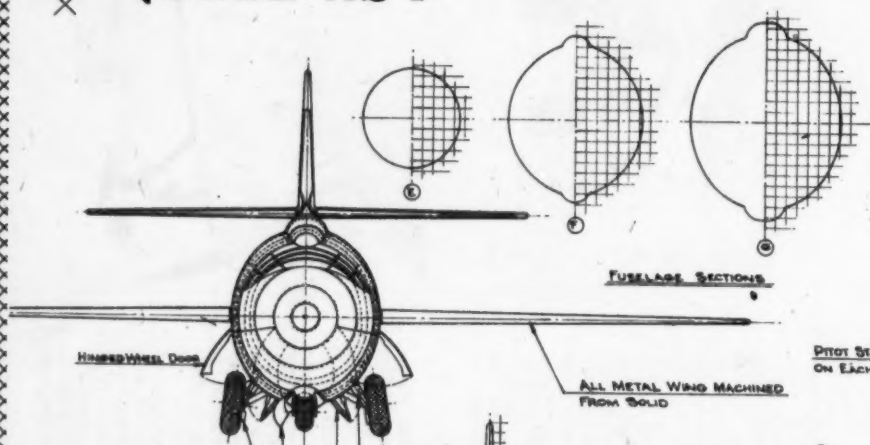
"BELL XS-I"

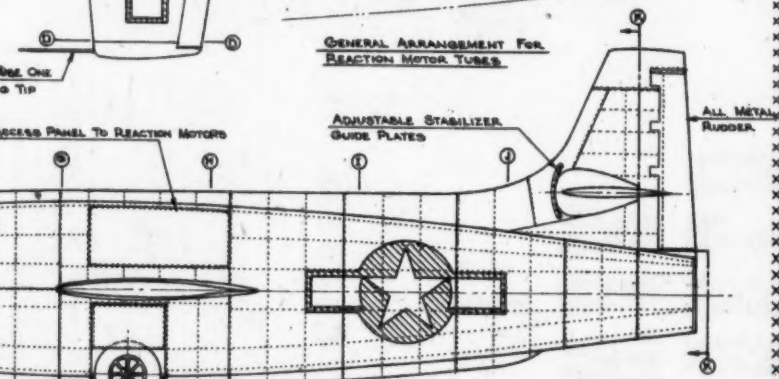
WING SECTIONS

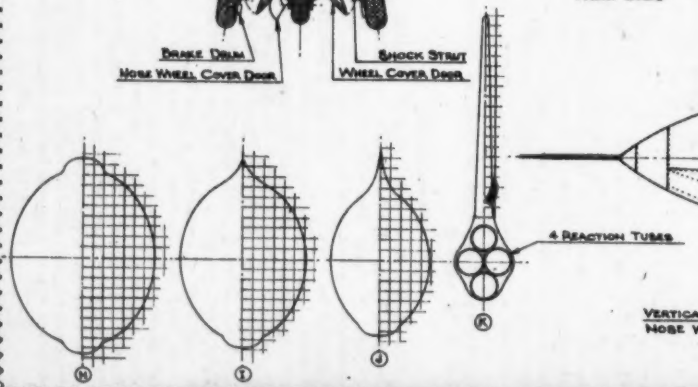
SPECIFICATIONS

FUSELAGE LENGTH	31'-0"
WING SPAN	28'-0"
WING AREA	130 Sq. Ft.
HEIGHT	10'-10"
POWER 4 REACTION MOTORS	
STATIC THRUST 1500 Lbs. EACH	
SCALE: 3/8"=1'-0"	






PITOT STATIC TUBE ONE ON EACH WING TIP
GENERAL ARRANGEMENT FOR REACTION MOTOR TUBES
ACCESS PANEL TO REACTION MOTORS
ADJUSTABLE STABILIZER GUIDE PLATES
ALL METAL RUDDER



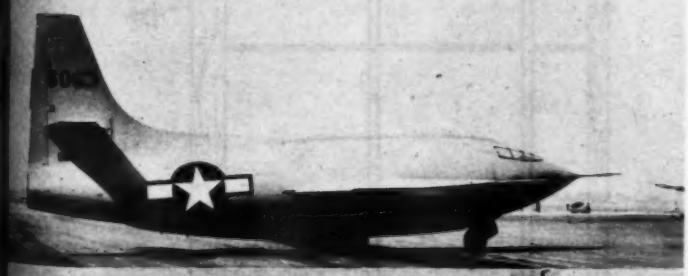
LEONARD WIECZOREK

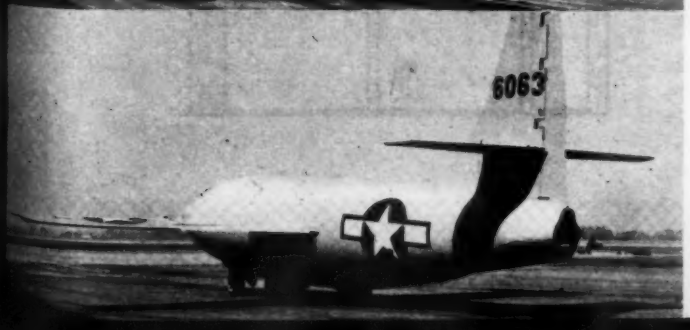
P.T.W.

BELL XS-1

PLANE ON THE COVER

by ROBERT MCLARREN





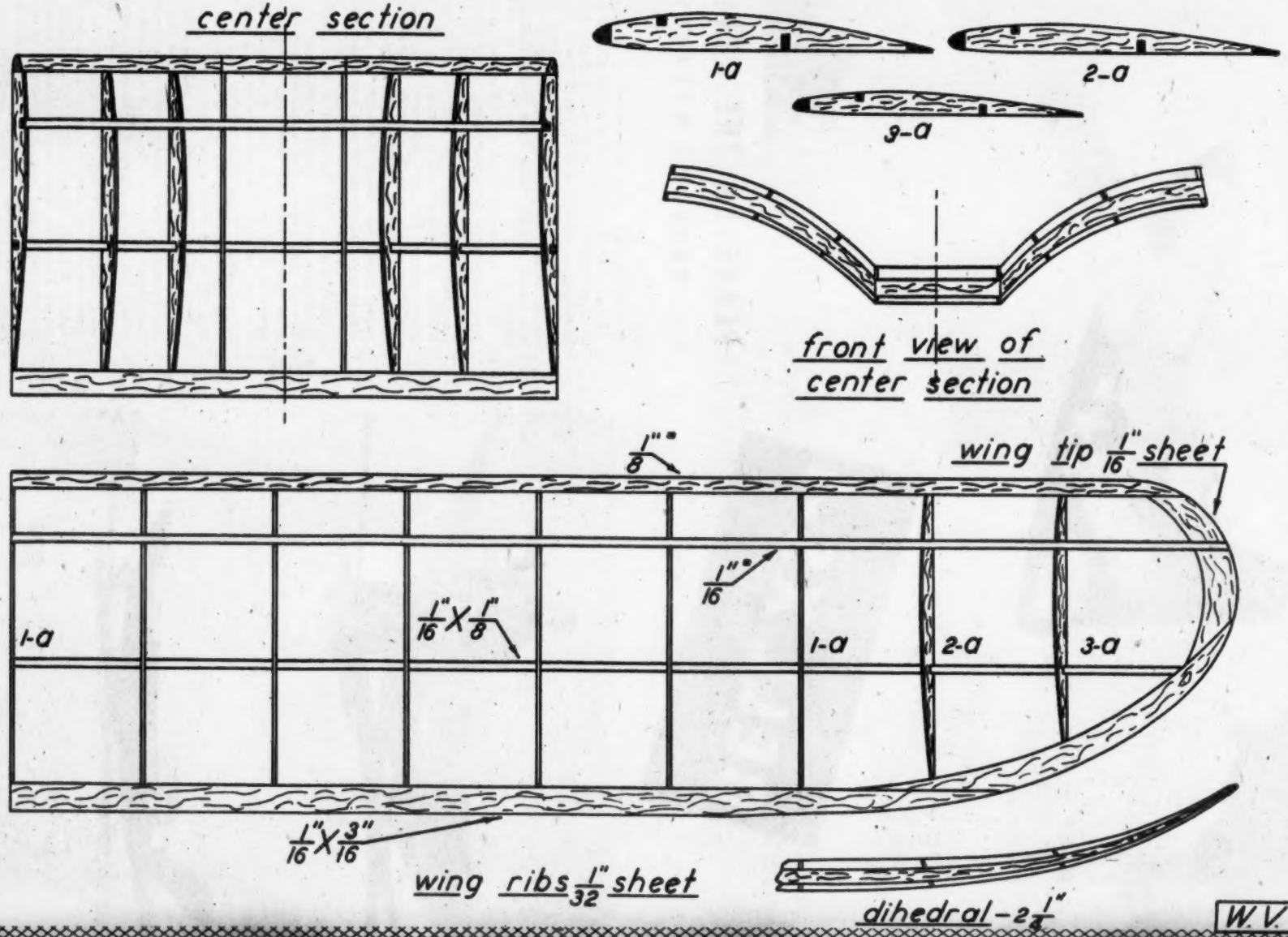
THROUGH the more than 43 years of aviation history the wind tunnel has grown progressively in importance until it occupies the major role in aeronautical research and the development of new aircraft. Today no major airplane is built or its design even completed until the results of extensive wind tunnel tests have been thoroughly analyzed.

But as speed grew and the difficulties of compressibility were more thoroughly understood, the phenomenon associated with the speed of sound remained a mystery. The past 30 years proved fruitful of aeronautical knowledge in the subsonic regime. The past 100 years have been as fruitful of results in the supersonic regime through the study of ballistics and shells in flights. But between these two large reservoirs of knowledge stands a gap of ignorance that has dared solution by the most capable men of this century.

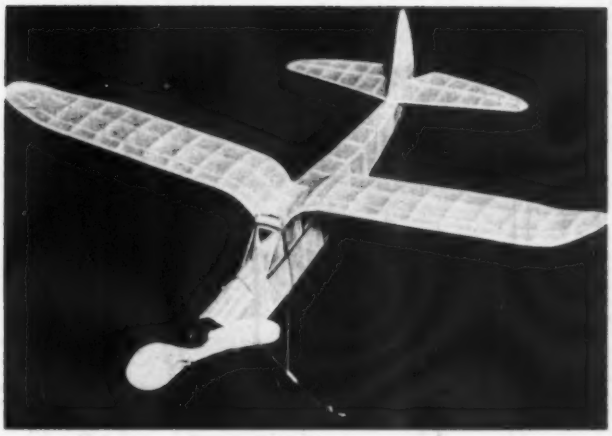
Mach number 1.0, the speed of sound, offers a challenge to modern aerodynamicists because it is through this region that airplanes and missiles must pass on their way to supersonic speeds and, again, on their way back down to subsonic speeds. The story of this battle of wits between man and an unknown is being written today, and one of its most important chapters will be penned by the Bell XS-1, our Plane on the Cover.

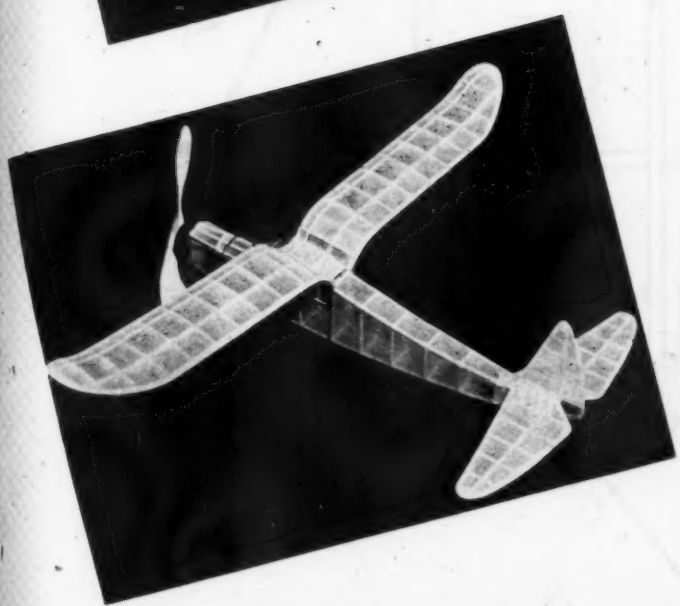
First clue in this mystery is the fact that we have no theory to guide us. The subsonic theory of aerodynamics, built laboriously by such men as Lanchester, Glauert, Prandtl, von Karman and others has always provided a clear blueprint for progress in research in the subsonic zone. Supersonic theory is also available, composed by these same men plus such mathematicians as Ernst Mach, Ackeret, Busemann, Ferri, Lippisch and others. However, there is no substantial theory for the transonic speed zone, in which part of the airflow is subsonic and part of it is supersonic. Aeronautical science is anxiously awaiting some unknown genius to step forward with a mixed flow theory, but until he does it has no highway down which to travel.

(*Turn to page* 83)


center section
1-a
2-a
3-a
front view of center section
wing tip 1/16" sheet
1/8"
1/16"
1/16" X 1/8"
1-a
1-a
2-a
3-a
1/16" X 3/16"
wing ribs 1/32" sheet
dihedral - 2 1/4"
W.V.

CABIN GULL WING





by WILLIAM VASSALLO

THIS distinctive looking model should catch the eye of even the most discriminating model builder. Its excellent flying qualities combined with simplicity of construction—and ruggedness as well—should make many builders keen on building this one.

Designed solely for the sport fan this little job can be made to produce—and with ease, too—flights that will open the eyes of many an expert. The plans have been further simplified by drawing full size layouts.

Just a final word before you start construction; take your time, using the utmost care with each step so the finished product will be a tribute to your craftsmanship.

FUSELAGE—Tack the plans to the bench, using wax paper between them and the work. Pin down the longerons and crossmembers of 3/32" square medium hard balsa. Both sides are made at the same time, one over the other so that both will be identical. When the sides are thoroughly dry take them up and separate them with a razor blade, making sure not to slice any of the longerons. Only half of the top view is shown so the dimensions will have to be doubled to acquire the proper sizes. Glue the top and bottom crossmembers in their respective positions, making sure the fuselage is kept straight as the work progresses.

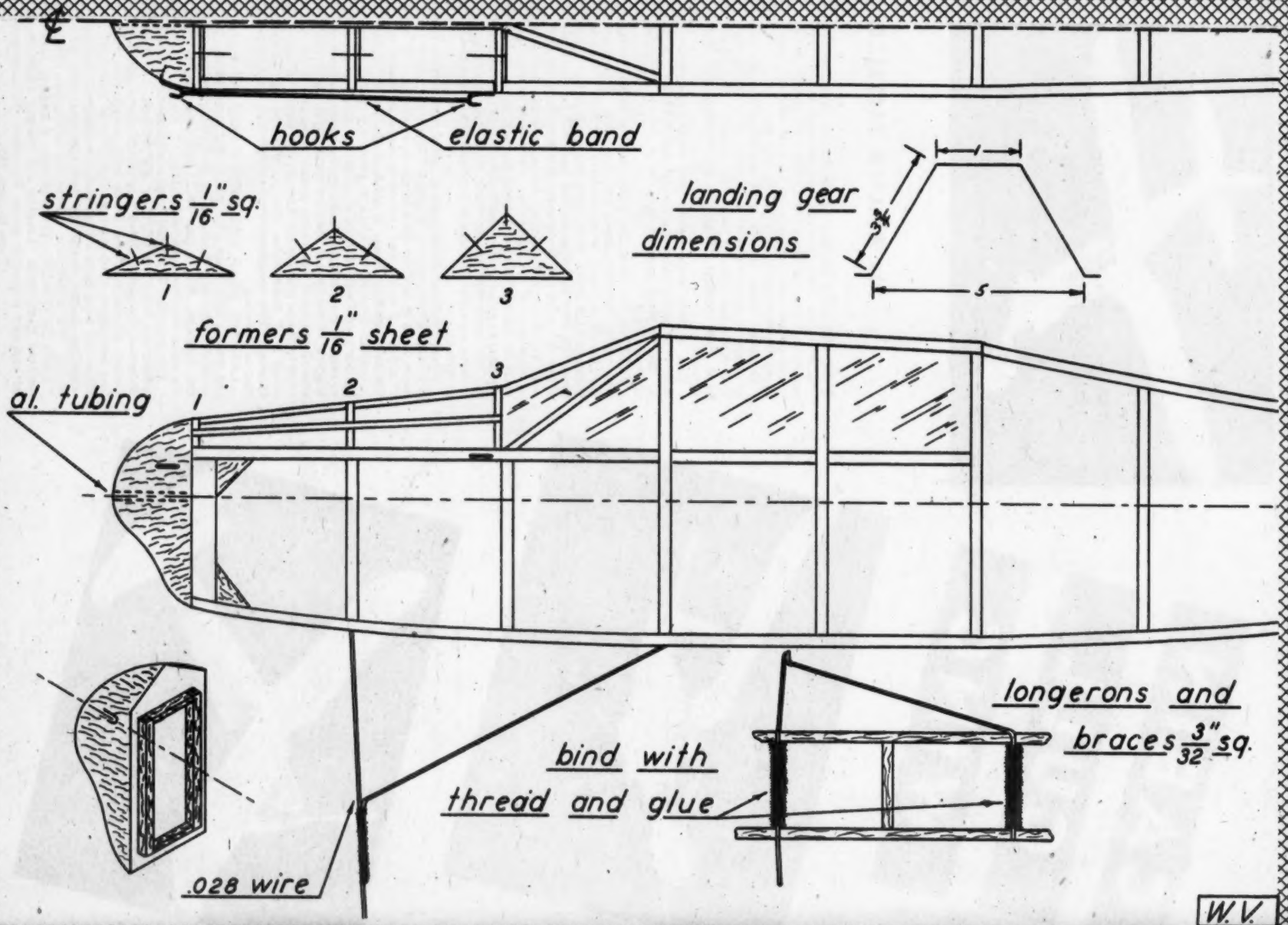
When all crossmembers are in place and waiting to dry, cut out formers 1, 2 and 3. The nose block is made from a medium hard block measuring 1-1/2" x 1" x 5/8". It is cut and sanded to shape as shown on the side and top views. A piece of aluminum tubing is pushed through the block to prevent wearing away by the prop shaft. Pieces of wood are glued in place at rear of the block, as shown on the plans, to prevent slipping. Now cement the formers in place. Add 1/16" square stringers and cabin pieces. The rear hook is bent to shape and forced through two pieces of laminated 1/16" sheet balsa. Glue in place at rear of the fuselage. This completes the fuselage with the exception of covering.

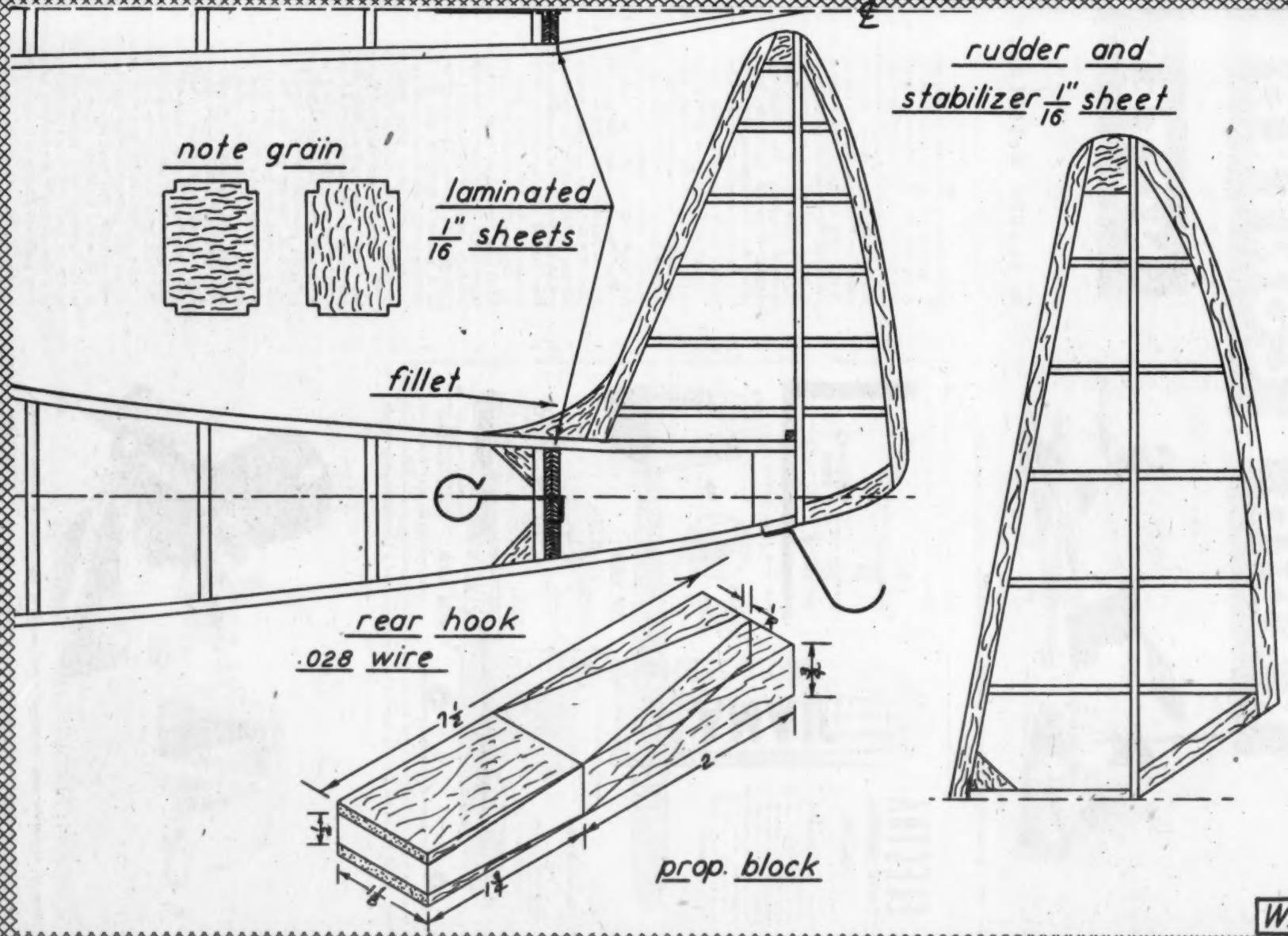
LANDING GEAR AND PROPELLER—The landing gear is bent from a length of .028 music wire. It is next glued and threaded in position at bottom of the fuselage. Slip a pair of 1" celluloid wheels on the axles and bend the ends back.

The propeller is carved from a medium hard block measuring 7-1/2" x 1-1/8" x 3/4". Blank it out as shown on the plans. Carve it as accurately as possible. Round off the tips and finish with rough and then fine sandpaper. Undercamber should be at least 3/32". Dope and sand until a high luster is obtained. A free wheeling device should be used for maximum efficiency. The builder can choose one of his own liking.

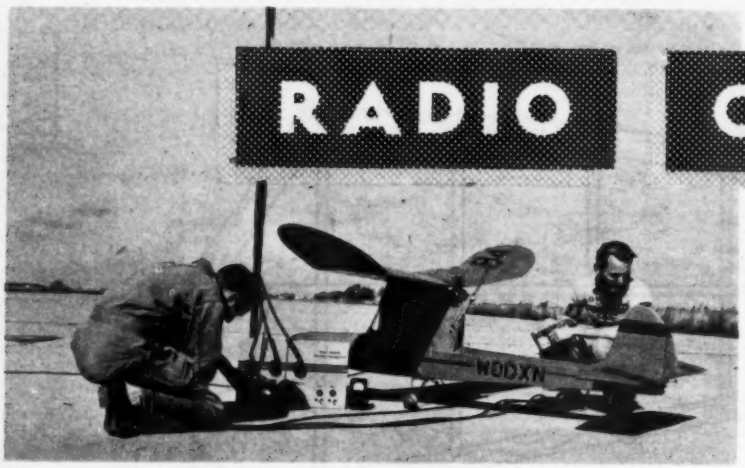
TAIL SURFACES—The stabilizer is built of 1/16" medium hard stock. Leading and trailing edges are cut out and pinned in place. Pin down the spar and

(*Turn to page 45*)


hooks
elastic band
stringers 1/16" sq.
1
2
3
landing gear dimensions
1
3 1/2
5
formers 1/16" sheet
al. tubing
1
2
3
.028 wire
bind with thread and glue
longerons and braces 3/32" sq.
W.V.

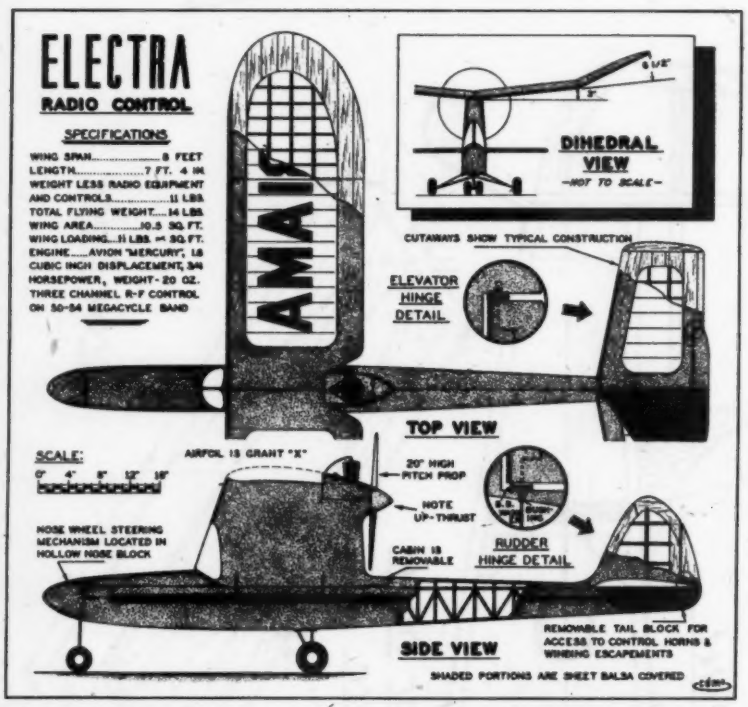

rudder and
stabilizer 1/16" sheet
note grain
laminated
1/16" sheets
fillet
rear hook
.028 wire
1½
2
prop. block
W.V.

RADIO CONTROL NOTES

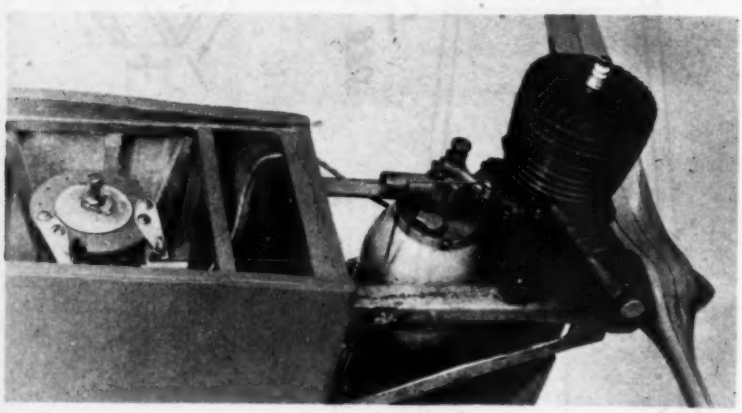


The radio control ship is readied for a flight . . . preliminary testing is important

by CLAUDE McCULLOUGH


ELECTRA
RADIO CONTROL
SPECIFICATIONS
WING SPAN.....8 FEET
LENGTH.....7 FT. 4 IN.
WEIGHT LESS RADIO EQUIPMENT AND CONTROLS.....11 LBS.
TOTAL FLYING WEIGHT.....14 LBS.
WING AREA.....10.5 SQ. FT.
WING LOADING...11 LBS. ÷ 10.5 FT.
ENGINE.....AVION "MERCURY", 1.8 CUBIC INCH DISPLACEMENT, 3/4 HORSEPOWER, WEIGHT - 20 OZ.
THREE CHANNEL R-F CONTROL ON 50-54 MEGACYCLE BAND
AMAIF
DIHEDRAL VIEW
-NOT TO SCALE-
CUTAWAYS SHOW TYPICAL CONSTRUCTION
ELEVATOR HINGE DETAIL
TOP VIEW
SCALE:
0" 4" 8" 12" 16"
AIRFOIL IS GRANT "X"
20" HIGH PITCH PROP
NOTE UP-THRUST
NOSE WHEEL STEERING MECHANISM LOCATED IN HOLLOW NOSE BLOCK
CABIN IS REMOVABLE
RUDDER HINGE DETAIL
SIDE VIEW
REMOVABLE TAIL BLOCK FOR ACCESS TO CONTROL HORNS & WINDING ESCAPEMENTS
SHADED PORTIONS ARE SHEET BALSA COVERED

Three view of the model gives an idea of its proportions and a few construction details



Closeup of mechanism used to control motor speed by movement of engine throttle

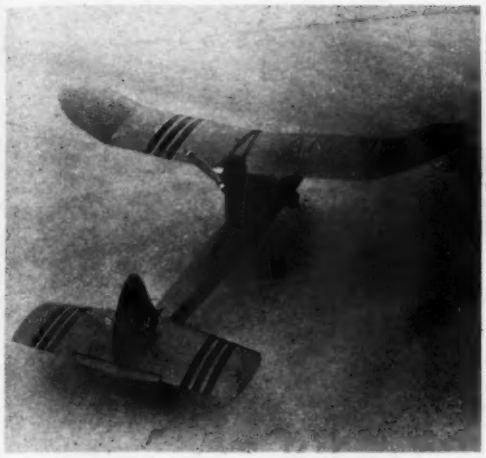
LIKE many a modeler in the service, I spent much of my spare time doodling on designs for an ultra-super radio control job and not infrequently using some of the excellent Signal Corps equipment which surrounded me to test out electronic brainstorms. Always intrigued by "R-C" and its possibilities, the flow of electrons the army subjected me to made building and flying my own remotely guided plane number one on my list of postwar projects. The resulting ship, christened the *Electra*, missed being completed for the Nationals by a few days but it otherwise proved to be a very satisfactory realization of my G.I. daydreams.

Large and heavy, it is intended as a flying test bench for various equipment and theories of procedure. In this assignment it has done yeoman service and has provided many definite conclusions on the ideal requirements for radio control.

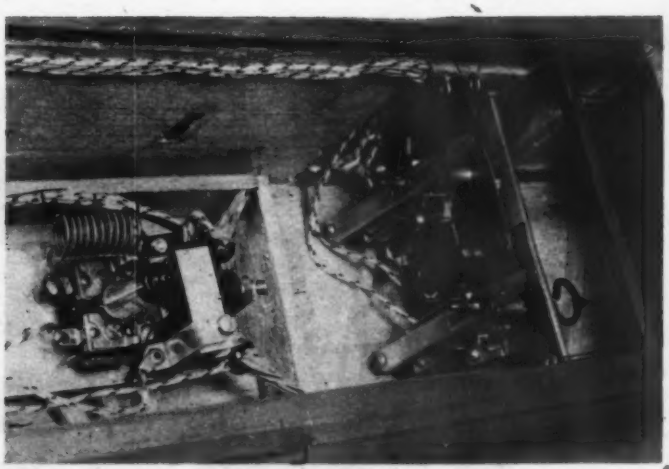
The plane's pusher design, along the lines of Jerry Stolof's *Super Yogi* (Oct. 1944 M.A.N.), was selected mainly to facilitate installation of a steerable nose wheel. Control on the ground during taxiing, takeoff and landing is given high recognition in the AMA's point system for judging R-C contests, and guiding the front gear enables an excellent variety of maneuvers. Jim Walker's 1946 Nationals-winning cabin job is equipped with this type control. Added advantage is gained in a pusher's stability and the lack of broken props, which can quickly run into money in the large sizes used on the *Electra*.

The plan is of conventional though extra-rugged construction. Body and cabin are bridge-girder style, planked with hard 3/32" sheet balsa. The wing and stabilizer have multiple spars à la Goldberg and are partially planked. Airfoil section used is Grant's X, chosen not only for its high lift qualities but for its ability to accommodate deep spars. All of the planked sections are covered with nylon and the remainder of the ship with silk.

Visions of landing gears tearing out large sections of fuselage to which they were attached in the event of a crash landing prompted their detachable design. The main gear is a separate unit, built on a sheet metal saddle which is strapped across the bottom of the fuselage with rubberbands. The nose wheel is fastened to a plywood bulkhead which is attached to the fuselage with hooks and rubberbands in much the same manner as that of a contest free flight firewall, permitting it to pull out during a rough comedown.



Note size of movable surfaces in contrast To total areas



Escapements used for rudder and elevator with one of the RK-61 receivers

The quest for structural strength was unfortunately carried a little to the extreme in building and as a result the ship has proven to be unnecessarily heavy. Its total flying weight of 14 lbs. gives it a rather high wing loading of 1½ lbs. per sq. ft. This in turn causes longer takeoff runs, high flying speed and pursuit-like landings. On one instance, however, this added strength paid off, when the *Electra* was inadvertently dived under power into a concrete runway, resulting in only a few cracks in the bottom planking near the nose. Such battering ram rigidity is handy, but under ordinary circumstances is a payload devourer.

The following figures are suggested as limits to follow in obtaining an efficiently operating and controllable R-C job: (1) Maximum wing loading—1 lb. per sq. ft. (2) Not more than two pounds of structural weight for every pound of radio and control equipment carried. (3) At least 1/5 hp for every 4 lbs. of flying weight. Exceeding these specifications will not produce an unflyable plane by any means, but a ship with a light wing loading and ample reserve power will be capable of a much greater degree of control than flying deadweights. In the case of the *Electra*, some 2 to 3 lbs. could easily be trimmed off the structure without seriously impairing strength.

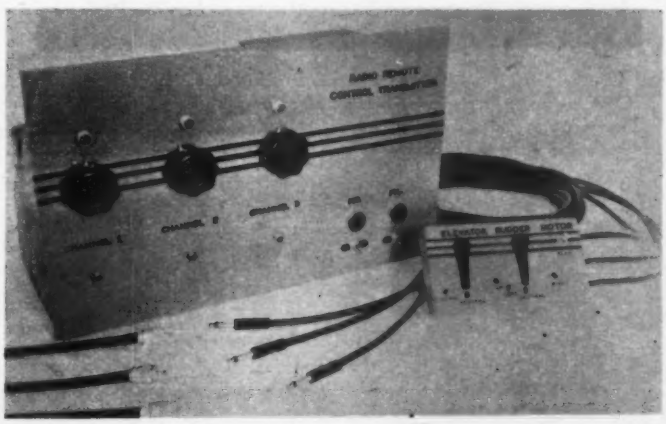
The Avion *Mercury* engine is used to power the *Electra*—and power is an apt word in this case. With a 1.6 cu. in. displacement it is the largest model airplane engine currently available. Made mainly from magnesium, its bare weight of 20 oz. and power output of ¾ hp at moderate RPM makes it a very efficient plant. The feature most valuable in radio control is the carburetor, which gives control over a full range of motor speeds from a slow idle, accelerating to full throttle.

The *Electra's* present control setup makes use of three channel RF control on the 50-54 megacycle amateur band. The three transmitters using RK-59 tubes were patterned after those presented by M.A.N. Editor McEntee in his classic series of articles on radio control that appeared back in 1939-1940 and are just as efficient now as they were then. Their single control tuning makes them easy to operate and adjust to frequency and ample power output to give positive action response.

Using many portable "put-put" gasoline powered electric generators in the army convinced me that they were ideal for R-C work and so this transmitter was designed to operate on 110 volts. The value of such an arrangement is that a good deal of the time the put-put is not needed since you can plug into a hangar socket or any 110 volt outlet near your flying site for transmitter power. During testing and adjusting in your workshop a 110v AC power supply

(*Continued on page* 80)

Large pylon is necessary to give clearance since the prop is 20" in diameter



Three channel transmitter allows independent control of motor, rudder and elevator

Twin nose wheels are steerable through interconnection with the rudder escapement

GLIDE TESTING

by W. H. S. BIRD
and J. S. LUCK

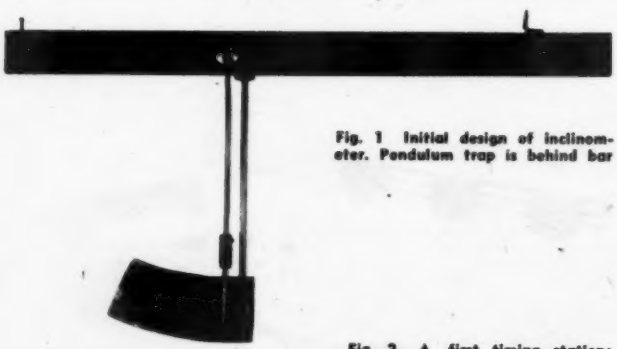
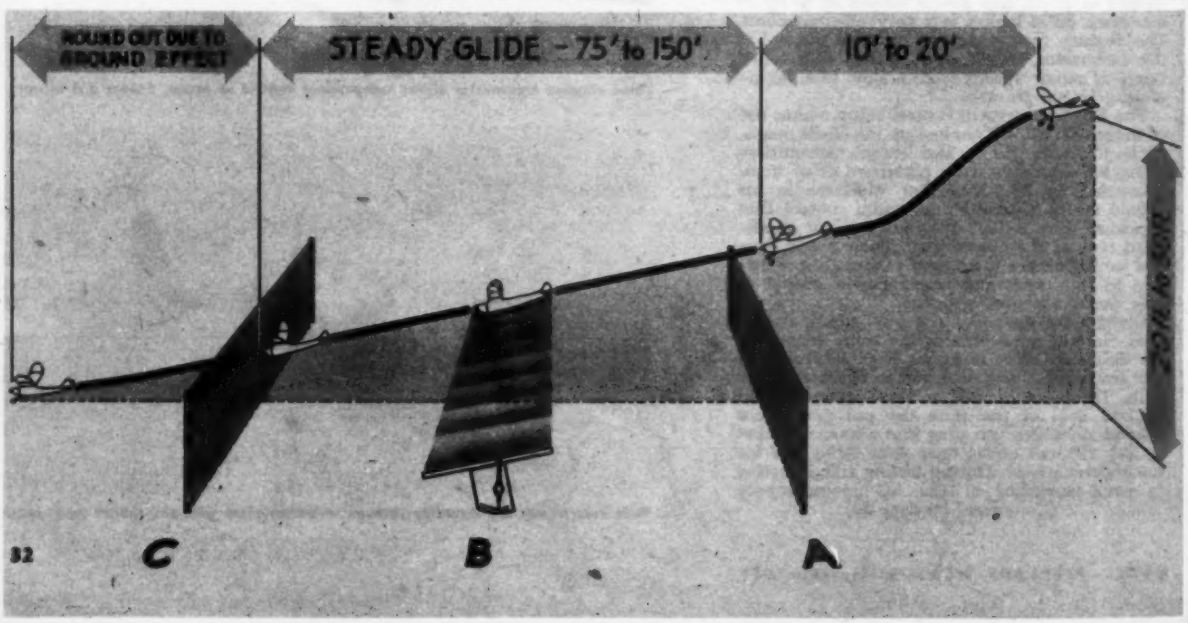


Fig. 1 Initial design of inclinometer. Pendulum trap is behind bar

Fig. 2 A, first timing station; B, inclinometer; C, second station

THERE have been many words written and published on the mechanics of glide testing. Most of those words are presented in a refreshing number of combinations, but the gist of them all boils down to a description of the fundamental steps in adjusting a model so that it merely neither stalls nor dives. On the other hand, very little has been said regarding the value of glide testing for assessing the merits of a design; or about the manner, and by what means, the several trimming (adjusting) variables may be established and combined to assure optimum performance.

Once a model is hoisted into the blue by its towline or its screaming powerplant, the two factors which make it cover the greatest distance in the longest possible time are: a *flat glide*, and a *low sinking speed*. Enthusiastic model builders, since the beginning of the model airplane age, have always been prone to make the most fantastic claims for their pet design. Such phrases as: ". . . gliding angle; fifteen to one . . . dead calm evening . . . etc., blah, blah!", fall as glibly from their lips as they would from Munchausen's. Well of course, "Pass the shovel, Bub" is a coarse way of inferring skepticism, and if we pretend not to have



heard the "dead calm evening" part, it is not really warranted. Such ratios are naturally possible, with the aid of thermals or updrafts, that is. Very much in the same way, a small flat stone in the hand of a skilled boy can be skipped over a smooth surface of water for as much as 100 feet—that stone would then have a glide ratio of about 50 to 1. Correct? Its sinking speed would be another matter though, wouldn't it?

Under existing A.M.A. rulings, a Class C gassie of exceptional workmanship and superior design which has been adjusted to the peak of perfection may attain the enormous figure of *nine* to one in still air. Six to one is average, and even two or three to one are not unheard of for poorly designed and badly adjusted models.

The object of glide testing (apart from debunking exaggerated performance boasts) is to provide a fairly accurate means of determining the one best arrangement of adjustment variables which will combine the greatest glide ratio with the lowest possible sinking speed. A very vague idea of an aircraft's flight tendencies can be formed by just heaving it into the air and then watching to see if it tries to make like an ostrich or a V.2. Haphazard corrective measures may then be applied until she seems to be behaving approximately the way she should. That sort of casual testing is O.K. for the builder who doesn't really care if his ship is at its best, so long as it just remains approximately right-side-up and follows its nose.

All serious aeromodelers have realized for a long time that glide analysis without the aid of measuring equipment is hardly reliable enough where the finer points of adjusting are concerned. The keenest eye would have a hard time, for instance, of judging which of several remedies gave the best glide to a model suspected of being slightly nose heavy. Was it when the wing incidence was increased by a degree or so; was it the 1/32" under the T.E. of the stab that did the trick; or did moving the C.G. back a trifle add

(*Turn to page* 42)

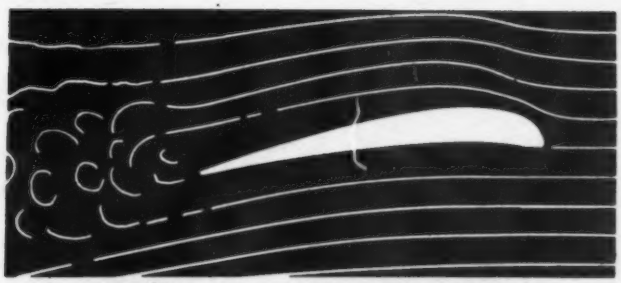
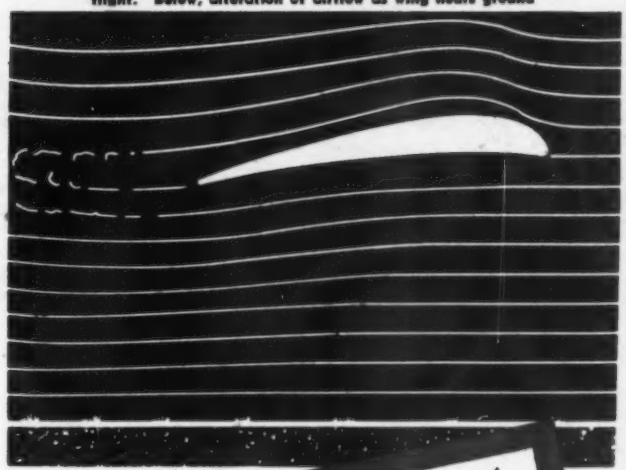


Fig. 3 Above, action of airflow over wing in normal flight. Below, alteration of airflow as wing nears ground



Make your own inclinometer from these plans; glide ratio plate is not to scale

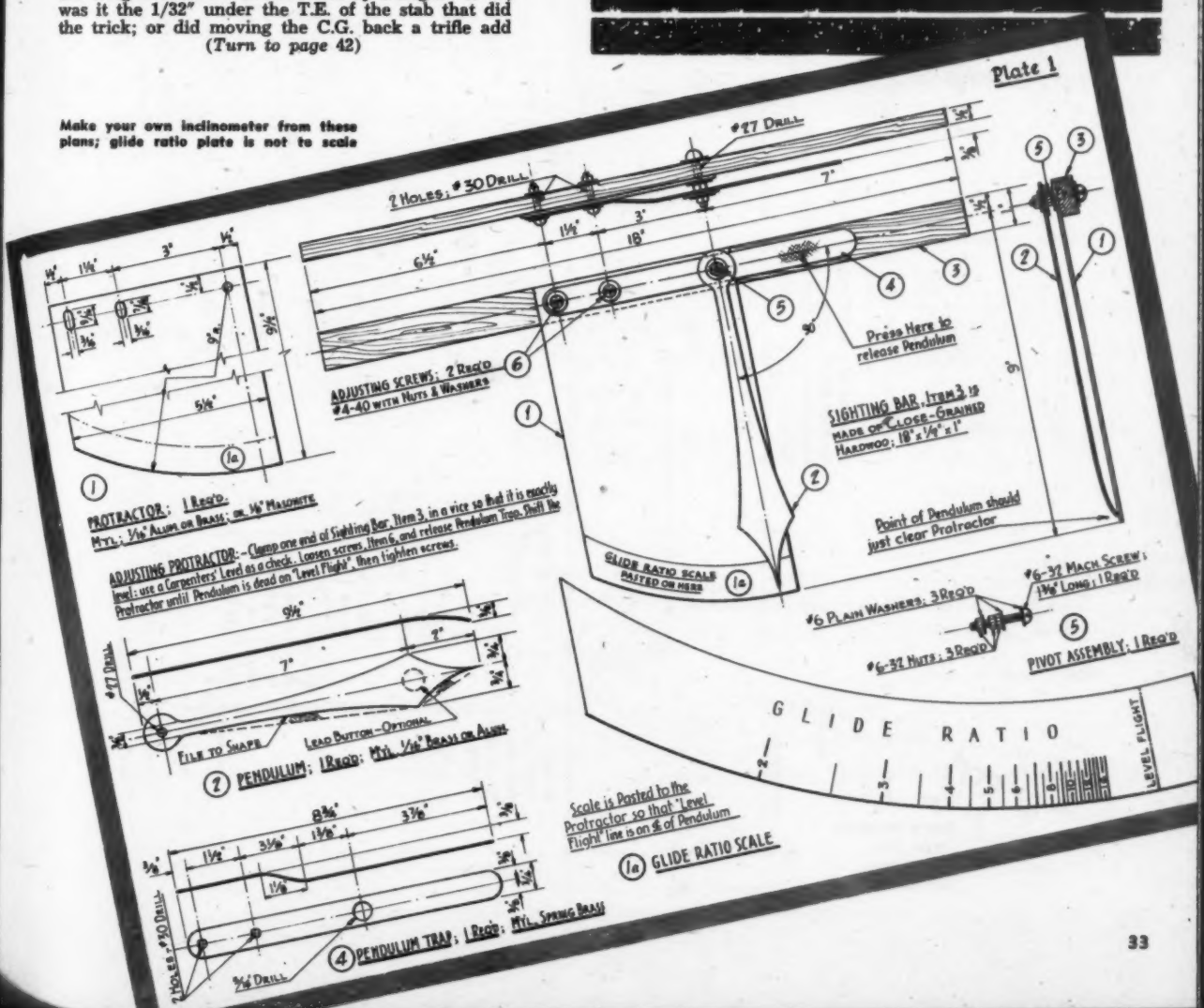
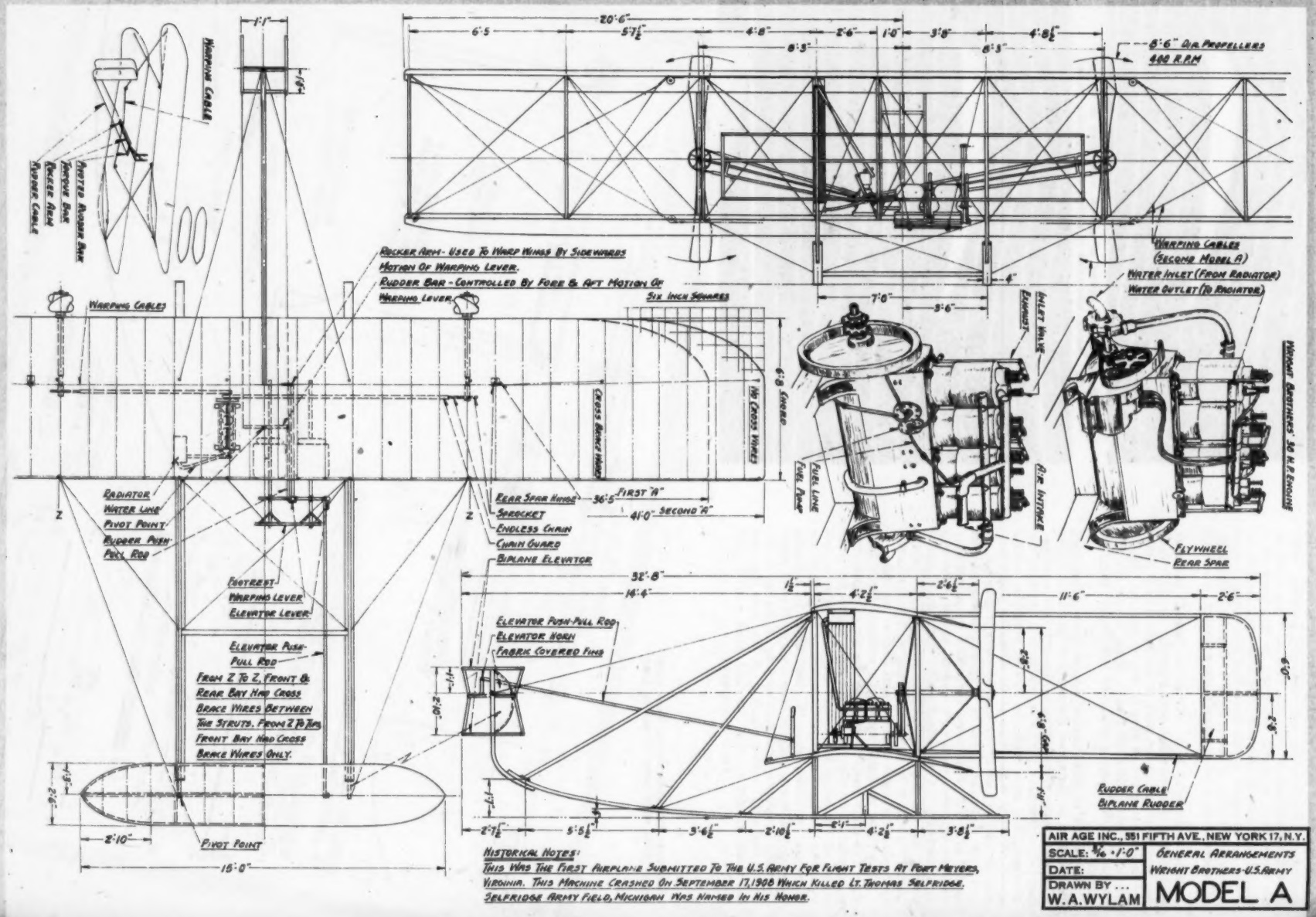


Plate 1
#27 DRILL
2 HOLES; #30 DRILL
ADJUSTING SCREWS; 2 REQ'D #4-40 WITH NUTS & WASHERS
Press Here to release Pendulum
SIGHTING BAR, ITEM 3, IS MADE OF CLOSE-GRAINED HARDWOOD; 18" x 1/4" x 1"
Point of Pendulum should just clear Protractor
PROTRACTOR; 1 REQ'D.
MTL.; 1/16" ALUM. OR BRASS; OR 1/4" MASONITE
ADJUSTING PROTRACTOR:- Clamp one end of Sighting Bar, Item 3, in a vice so that it is exactly level; use a Carpenters' Level as a check. Loosen screws, Item 6, and release Pendulum Trap. Shift the Protractor until Pendulum is dead on "Level Flight", then tighten screws.
GLIDE RATIO SCALE PASTED ON HERE
#6 PLAIN WASHERS; 3 REQ'D
#6-32 MACH SCREW; 1 3/16" LONG; 1 REQ'D
#6-32 NUTS; 3 REQ'D
PIVOT ASSEMBLY; 1 REQ'D
FILE TO SHAPE
LEAD BUTTON—OPTIONAL
PENDULUM; 1 REQ'D; MTL. 1/16" BRASS OR ALUM.
GLIDE RATIO
LEVEL FLIGHT
Scale is Pasted to the Protractor so that "Level Flight" line is on ⅝ of Pendulum
GLIDE RATIO SCALE
PENDULUM TRAP; 1 REQ'D; MTL. SPRING BRASS
2 HOLES; #30 DRILL
3/16" DRILL



ROCKER ARM - USED TO WARP WINGS BY SIDEWARDS MOTION OF WARPING LEVER.
RUDDER BAR - CONTROLLED BY FORE & AFT MOTION OF WARPING LEVER.

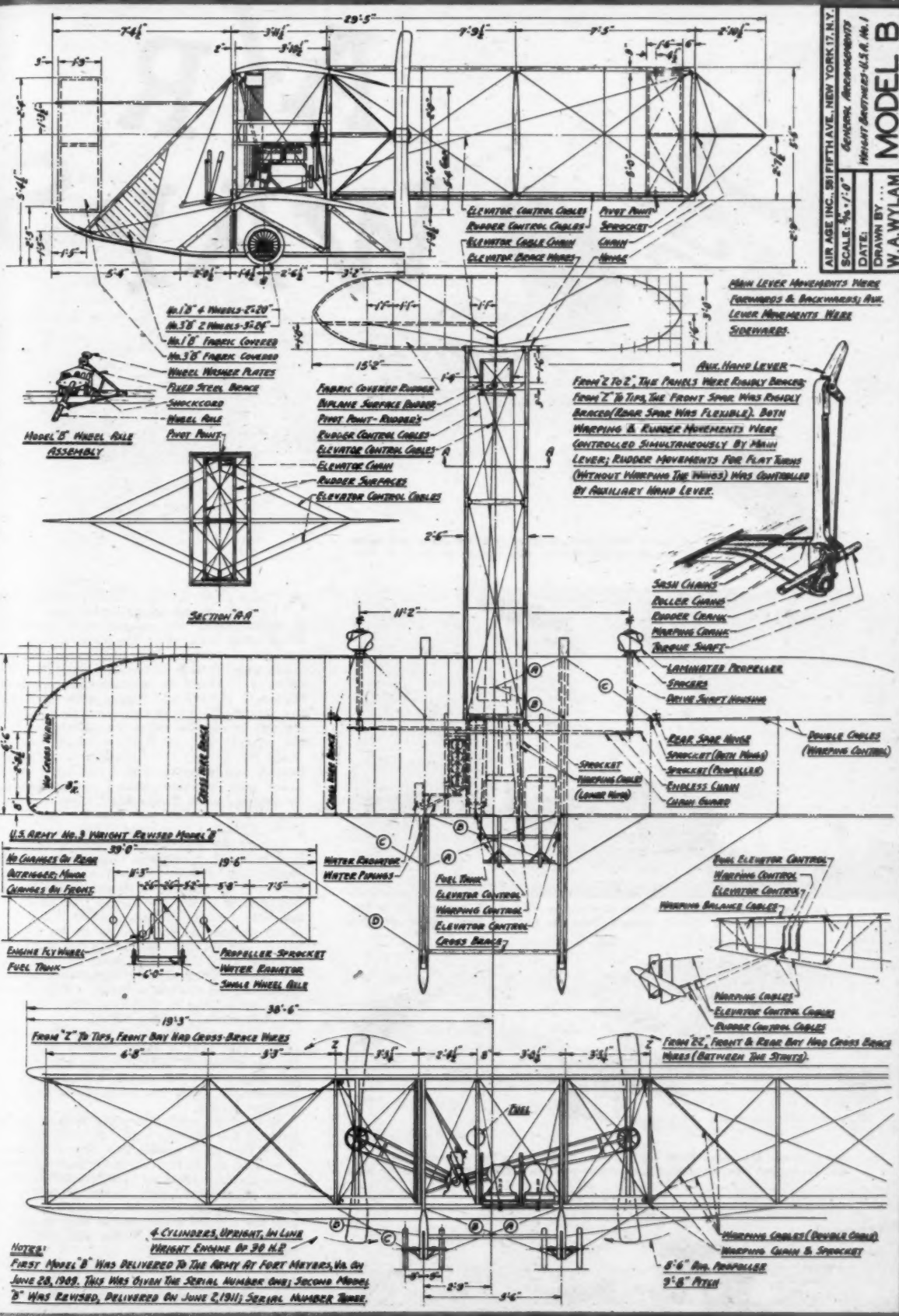
ELEVATOR PUSH-PULL ROD FROM Z TO Z, FRONT & REAR BAY HAD CROSS BRACE WIRES BETWEEN THE STRUTS. FROM Z TO ZZ, FRONT BAY HAD CROSS BRACE WIRES ONLY.

HISTORICAL NOTES:
THIS WAS THE FIRST AIRPLANE SUBMITTED TO THE U.S. ARMY FOR FLIGHT TESTS AT FORT MYERS, VIRGINIA. THIS MACHINE CRASHED ON SEPTEMBER 17, 1908 WHICH KILLED LT. THOMAS SELFRIDGE. SELFRIDGE ARMY FIELD, MICHIGAN WAS NAMED IN HIS HONOR.

AIR AGE INC., 551 FIFTH AVE., NEW YORK 17, N.Y.	
SCALE: 4/16 = 1'-0"	GENERAL ARRANGEMENTS
DATE:	WRIGHT BROTHERS-U.S. ARMY
DRAWN BY ... W. A. WYLAM	MODEL A

WYLAM MASTERPLAN • WYLAM MASTERPLAN

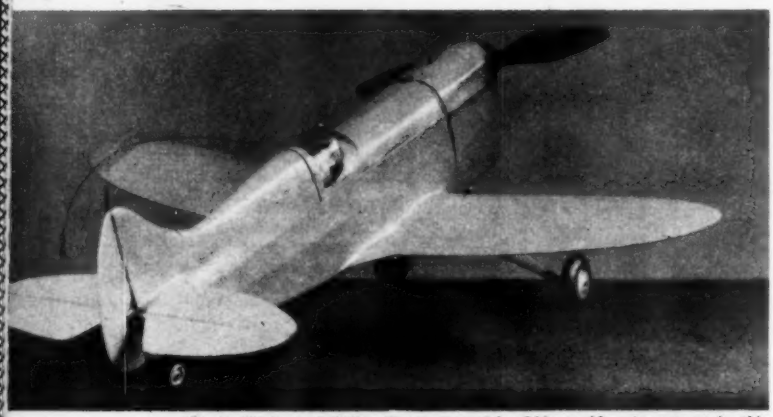
WYLAM MASTERPLAN ● WYLAM MASTERPLAN



WYLAM MASTERPLAN ● WYLAM MASTERPLAN

AIR WAYS

No. 1. This beautiful glider is called *Scylla* and is an English design. Picture was sent to us by G. B. Dun



No. 2. Sleek control line flyer powered by *Ohlsson 60*, sole entrant in this class in a big Chinese contest. Ship was built by Capt. Robert M. Diel

No. 3 (above) Blackburn *Shark* built by Sam H. Chewning has 36" span. No. 4 (below) Seven-foot Piper Cub has *Rocket* motor and was built by Navy vet D. C. Vann

A PLEA FOR FREE FLIGHT—While we have discussed contest rules many times in these pages, the subject will probably never grow stale since the rules vitally affect every contest flier, and even produce hobbywide trends in model aviation. We recently received an impassioned plea from Milton C. Burley of Chicago who feels that the free flight gas model class is bound to die out unless the rules are altered so that the models will be kept more in bounds. Since Mr. Burley is a seasoned contest flier, having won many contests including a three-times win of the annual championships sponsored by the *Times* Air Cadets and Chicago Park District, we feel he should be given a chance to air his views.

During the war these contests were flown with a 4 min. maximum flight limit and Mr. Burley used a dethermalizer on all his ships. He could then launch a model on the hottest day, secure in the knowledge that even if it got into a super thermal, when 3-1/2 min. or so passed the ship would be on its way down, still in sight and ready for more flying that same day. Now, with no time limit, he has to block the dethermalizer and he stands a good chance of losing a ship at each meet, something he, and most other modelers for that matter, cannot afford.

Another angle brought up by Mr. Burley is the fact that a large model, such as a *Hornet*-powered *Sailplane*, has a much better chance than let us say a *Zipper*, merely because the timer can keep the large model in sight longer.

Since most contest scoring is now on the basis of the average time (or total time) for three flights, it seems that few contestants would be apt to turn in three perfect flights, were the time limit set at a reasonable maximum of perhaps 5 min. In this way the contestant would strive for consistent results and the winner would not be able to cop the big trophy with two fizzles and one O.O.S. flight.

Mr. Burley offers the following suggestions:

1. Eliminate the crossection rules (which

News of model airplane experimenters from all over the world—also comments on some current model problems

No. 10. This original controliner by J. Borzner has Rogers 29 motor and a removable power unit which can be shifted to other ships when required

No. 11. Stubby bipe from George Struman

No. 8 (right). TWA pilot Tom Wardlaw with his original called the *K.C. Terror.*
No. 9 (left). Flying scale rubber B-26 took D. Norian 2½ years to complete

often breed only weird pylon jobs so the pylon can be counted as crossection).

2. Raise power loading and wing loading sufficiently so the airplane will be able to handle the power of present day motors, and will be rugged enough to stand continued contest flying.

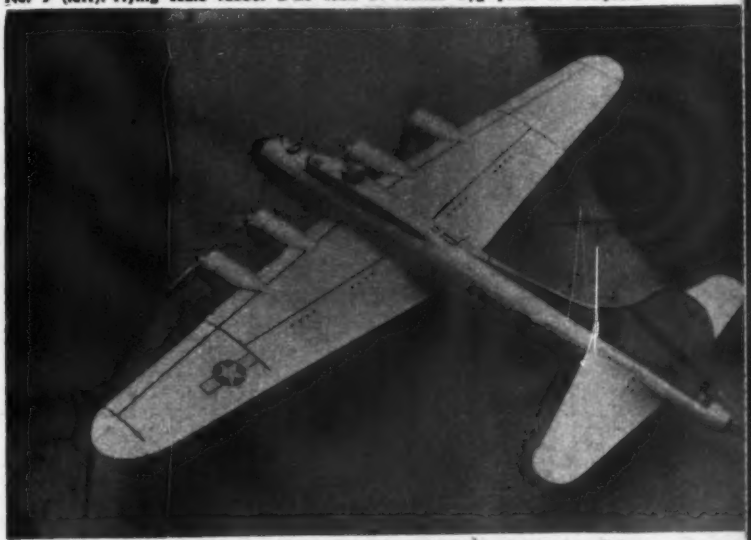
3. Set a maximum time limit of perhaps 5 min., enough for a well adjusted ship to show what it can do yet short enough to bring it down before it leaves the sight of the timer and owner.

Let's hear from other free flight enthusiasts on this subject.

EAST-WEST CHALLENGE MEET—As we expected, the challenge of the speed champs among East Coast control fliers has aroused great interest among the hot shots of the West (see "West Coast Tips", Feb. 1947 issue). Plans are now a little more advanced and the Eastern gang has set dates for elimination meets and speed trials as follows: May 4, 11, 18, 25; June 1, 8, 15, 22, 29; July 6, 13, 20, 27. A.M.A. sanction for the final contest has been requested for Aug. 23 and 24. The place has not been definitely settled, but Chicago or Detroit are under consideration. The final contest will be held between 7 p.m. and 7 a.m. on both dates so that the relative humidity will be the same for everyone.

East Coast builders interested in registering for the trials may contact Tom Herbert at Westchester Hobbies, 259 Mamaroneck Ave., White Plains, N.Y.—Westerners should get in touch with Johnny Davis at 1975 Beachwood Dr., Hollywood 28, Calif. News of further developments will be posted in these columns as plans crystallize.

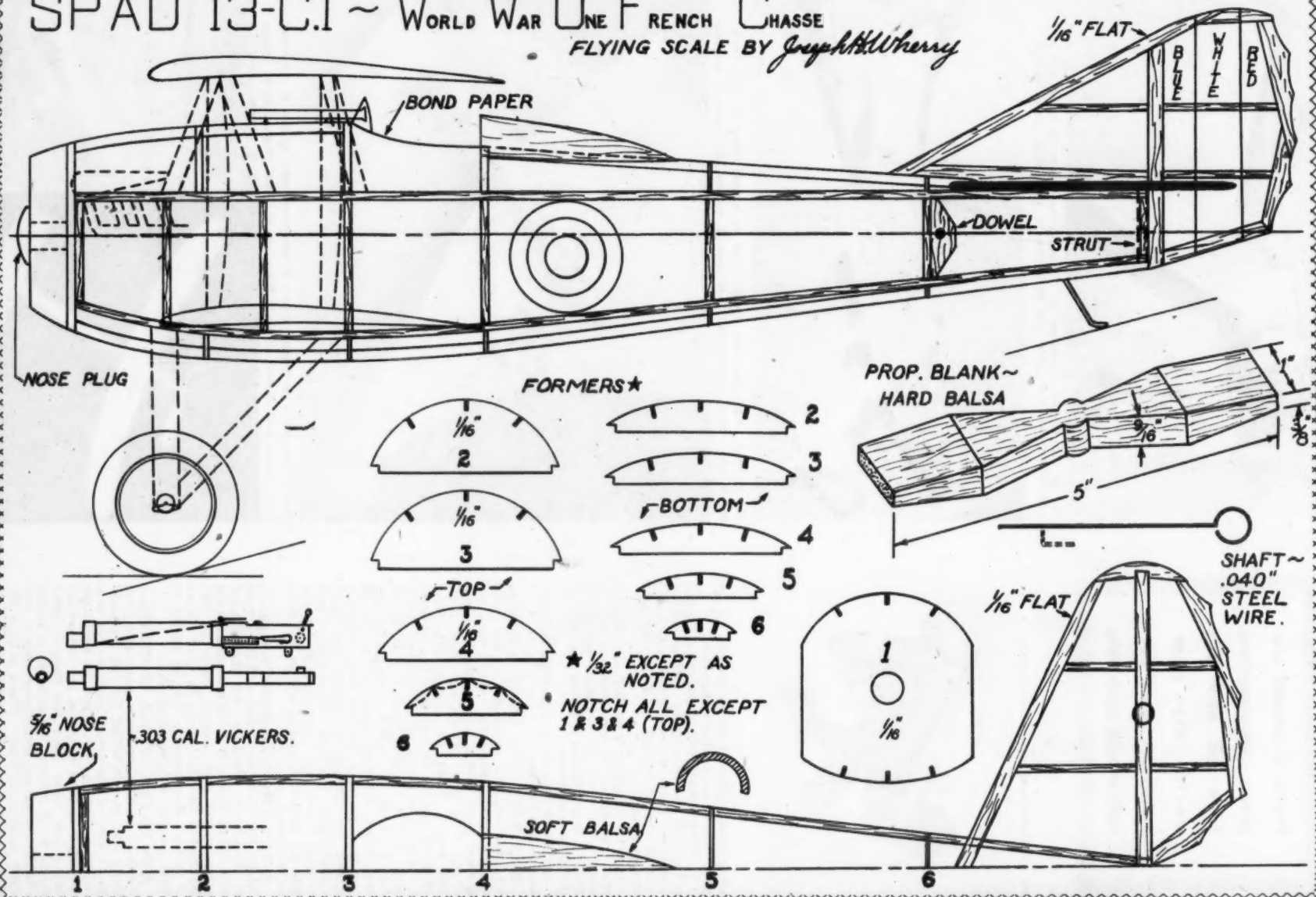
HOW TO DISCOURAGE BEGINNERS—We have received a bitter complaint from Major J. R. Morris, USMC Ret., on the quality of some of the model airplane kits now on the market. As this is not the only such comment we have heard on the subject we feel a few notes from the Major's letter should be of interest. Since he is no longer a beginner, having constructed over a half dozen models, all from (*Turn to page 89*)



No. 7. This B-17G of Eugene Adams is completely built up but is non-flying
No. 5 (below left). Rubber job by C. Wells. No. 6 (right). Original by W. Blanck

SPAD 13-C.1 ~ World War One French "Chasse"

FLYING SCALE BY Joseph H. Wherry



MODEL SPAD 13

by JOSEPH H. WHERRY

ALL of you flying scale fans will want to build a model of the ship that proved to be the ace of the pack for the Yanks in World War I. The little Spad 13 carried dozens of our boys to fame in those days. In addition, the majority of French pursuit squadrons were equipped with Spads by 1918 and many more Spads were in use by the British, Belgians and Italians. Our own Eddie Rickenbacker won fame in a Spad 13.

The Spad 13 had a span of 26 ft. 10 in.; length was 20 ft. 8 in.; it was powered with the 220 hp. Hispano-Suiza engine, and the armament was two cowl-mounted Vickers machine guns. The top speed was about 130 mph. Spad pilots often eluded a pursuer by diving because of the unusually rugged construction.

Now let's get to the workbench and build one of these little jobs for that model tarmac.

FUSELAGE—Working directly over the plans build the two flat sides of 1/16" square balsa. Be sure to include the small gusset near the rear which holds the 1/16" dowel for securing the rubber motor. Cut the formers from sheet stock. All bottom formers are cut from 1/32" sheet; Nos. 2, 3 and 4 top formers are of 1/16" sheet; and the nose former (No. 1) is of 1/16" sheet. Notch all formers to receive the 1/32" x 3/32" stringers. Cement the two fuselage sides together at the extreme rear at the same time cementing in place the top and bottom No. 6 formers. Work slowly forward cementing the formers in place; always install corresponding top and bottom formers at the same time. Construction is thus made lighter by eliminating the usual 1/16" square crosspieces. A crosspiece is used only at extreme front of the fuselage. When this much of the structure has dried, cement No. 1 former in place. The stringers (1/32" x 3/32" strips) may now be added. Cover the upper portion of the fuselage between formers 3 and 4 with bond paper and cut out to form cockpit.

The 5/16" thick balsa nose piece is now added. Cut this plenty large and cement in place. When dry it can be carved to the exact shape very simply. Sand the entire framework now so that it will be smooth and ready for covering later. The tail skid of either bamboo or music wire is now added to complete the fuselage for the time being.

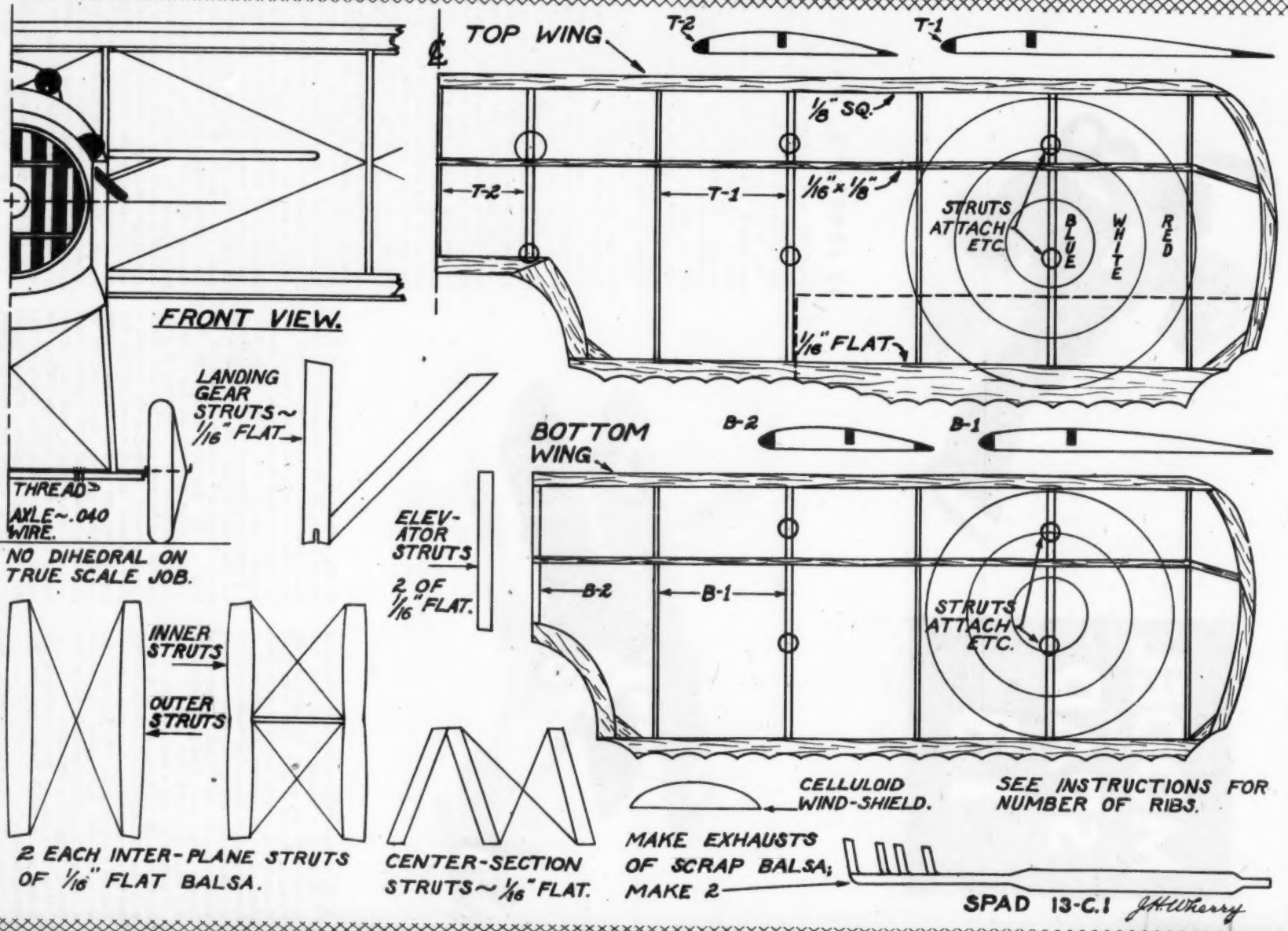
The tail surfaces are built up from 1/16" flat balsa. You'll need to trace the right half of the elevators on thin paper; invert this tracing and retrace; place this tracing alongside the half shown on the plans and build the elevators in one piece. When finished, sand the tail surfaces smooth and round the leading and trailing edges and the tips and lay aside.

The wings are next, but first trace the right halves shown. Invert these as you did for the elevators and make the plans for the left wings. The wings are built directly over the plans: the top wing in one piece, the bottom wing in two. Now for the ribs: for the top wing cut three ribs T-2 of 1/16" sheet, six T-1 ribs of 1/32" sheet, and four T-1 ribs of 1/16" sheet; for the bottom wing cut two B-2 ribs of 1/16" sheet, six B-1 ribs of 1/32" sheet, and four B-1 ribs of 1/16" sheet. Leading and trailing edges and spars of dimensions noted on plans must be provided and we are ready to start assembly.

Build the wings in the conventional manner over the plans, holding the various parts in place with pins until dry. The spars, tips and centersection curved parts are cemented in place last. Round the leading edges and streamline the trailing edges and the tips. Scallops are easily made by wrapping fine sandpaper around a pencil and carefully sanding at the proper intervals. Incidentally, these scallops existed on the real Spads because the trailing edge was actually a wire for extreme thinness. When the covering was doped, the wire was drawn in to form the scalloped, or serrated, trailing edge. Sand the entire wing structures to assure a smooth covering job.

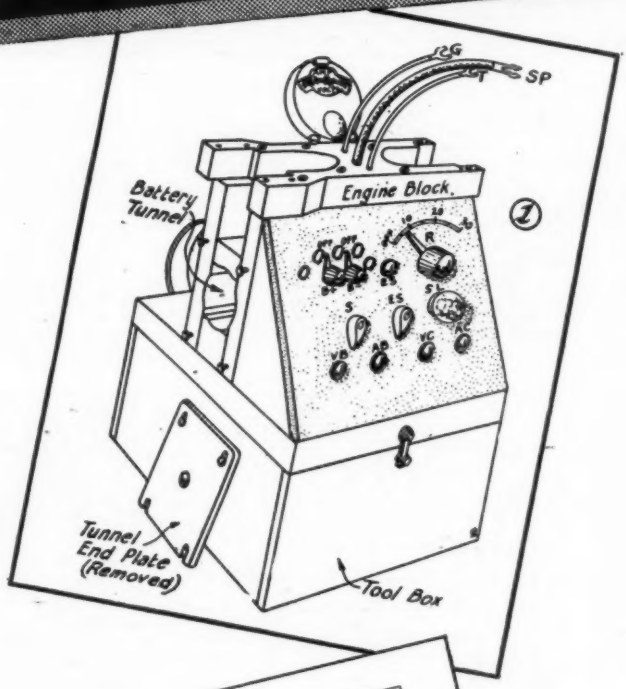
Just a note to the detail fans that the

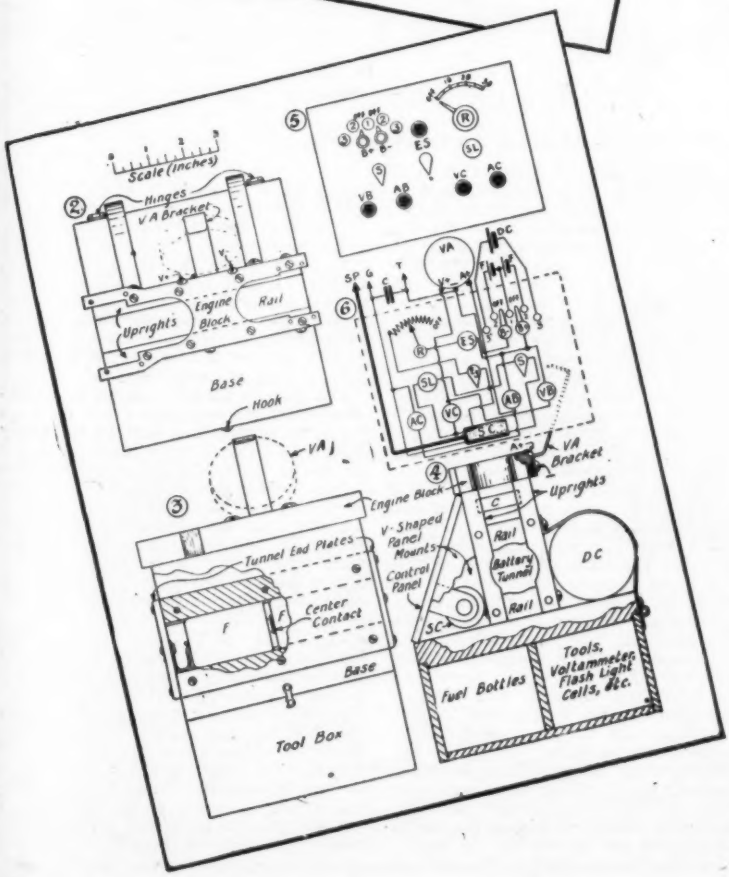
(Turn to page 66)


TOP WING
T-2
T-1
1/8" SQ.
1/16" x 1/8"
STRUTS ATTACH ETC.
BLUE
WHITE
RED
1/16" FLAT
FRONT VIEW.
LANDING GEAR STRUTS ~ 1/16" FLAT
THREAD
AXLE ~ .040 WIRE.
NO DIHEDRAL ON TRUE SCALE JOB.
BOTTOM WING
B-2
B-1
ELEV-ATOR STRUTS
2 OF 1/16" FLAT.
INNER STRUTS
OUTER STRUTS
2 EACH INTER-PLANE STRUTS OF 1/16" FLAT BALSA.
CENTER-SECTION STRUTS ~ 1/16" FLAT.
CELLULOID WIND-SHIELD.
SEE INSTRUCTIONS FOR NUMBER OF RIBS.
MAKE EXHAUSTS OF SCRAP BALSA; MAKE 2
SPAD 13-C.1 J.H. Wherry

ENGINE LABORATORY

by RAY RUSHER





ANY modeler who has time on his hands and an urge to make a really complete portable engine run-in stand combined with an ignition analysis system will find the engine lab of drawing 1 a worthwhile project. The stand is mounted on a tool box that elevates the engine block so there is room for swinging a 14" prop. In addition to tools, spare flashlight cells, fuel bottles, extra sparkplugs, etc., can be carried in the tool box.

For details the reader is referred to the drawings. No. 2 is a plan view, 3 a side view, and 4 an end view. No. 5 shows the control panel, and 6 its reverse side including wiring.

The stand consists of a base, a pair of uprights and an engine block, the parts being assembled by means of screws. The engine block can be designed to mount different large engines, and adapters can be connected to it for smaller ones. The block illustrated is for an *Ohlsson 60* at one end and an *Ohlsson 23* at the other.

The main source of current supply is a No. 6 dry cell (DC) which, if it tests anywhere between 15 and 30 amperes, will give sufficient power for an efficient spark coil to start most engines. The battery tunnel holds two large (size D) flashlight cells (F) which can be used in series for starting if DC proves insufficient. After starting, the ignition can be switched to the No. 6 dry cell, and it will be found to have a life that is many hours long in terms of running time of the engine when a rheostat is used to cut the current to minimum requirements as will be later explained.

Mounted on the control panel are the following electrical instrumentalities:

1. Rheostat (R)
2. Battery switch (B+, B—, 3, 2, 1, 2, 3)
3. Engine stop pushbutton (ES)
4. Battery voltage pushbutton (VB)
5. Battery amperage pushbutton (AB)
6. Pushbutton (VC) to test voltage across spark coil
7. Pushbutton (AC) for amperage through spark coil
8. 3 volt flashlight bulb (SL) to serve as signal light by indicating whether spark coil is energized or not (timer points closed or open)
9. Switch (S) for signal light so that it can be turned off when not needed during tests

All the parts just listed are mounted on the control panel. A spark coil (SC) is mounted on the back of the panel as shown in drawing 4 and shown stippled in drawing 6.

The switches S and ES may be enlarged versions of the ignition switch described in July 1945 MODEL AIRPLANE NEWS. The pushbutton differs from the usual type in that it is normally closed instead of normally open. The rheostat is preferably homemade of 24 in. No. 20 *Nichrome* wire wound on a suitable insulation base, such as asbestos board, that will withstand the heat generated in the wire. Commercially available rheostats of sufficient capacity are usually too bulky for the limited space available for mounting them. The rheostat can be calibrated arbi-

(*Turn to page* 87)

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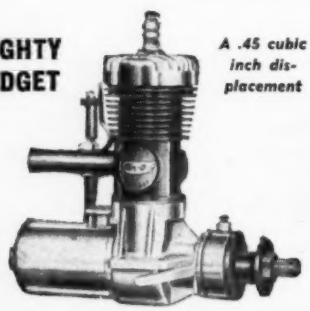

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Glide Testing

(Continued from page 33)

that little extra that produced the perfect glide. Fortunately it is within the means and ability of every model man to equip himself with apparatus to set his mind at rest. The homemade inclinometer, Fig. 1, might not satisfy the N.A.C.A. but it will give comparatively accurate readings and is guaranteed to be many times more reliable than the naked eye.

Plate 1 shows details and assembly of a simple instrument. The drawing is self explanatory, but for those who are not too well versed in reading mechanical drawings the construction will be described as well.

INCLINOMETER—Study Plate 1 carefully to form an idea of the principle of the instrument. Remember that because precision is more important than weight and to some extent strength, any suitable scrap material may be employed. When the specifications call for 1/16" aluminum or brass, don't groan over the fact that all the old scrap box yielded was a piece of 16 or 20 gage copper—it will do just as well.

Lay out the protractor (Item 1) and in doing so make absolutely certain the 9" radius of the bottom edge is *exactly* 9". The scale may be enlarged by photostat or photographically so that it is exactly 5-1/2" long measured between vertical lines at the ends. Drill for the pendulum pivot (Item 5) and make slots for the adjusting screws (Item 6).

Shape up the Sighting Bar, Item 3, from straight-grained hardwood; birch, beech, gumwood and poplar are suitable. Using the finished protractor as a template, drill for Items 5 & 6. Brush on several coats of dope or varnish to prevent moisture absorption and possible warpage.

The Pendulum Trap (Item 4) is the hardest thing to make in the whole assembly only because it is usually difficult to drill a large hole into really hard, thin brass unless the bit is specifically sharpened for the purpose. However, if the 5/16" dia. hole is made by reaming out a much smaller hole, with the tine of a file for instance, the job is fairly easy. The thickness of the material may vary from 1/32" to 1/16".

The pendulum (Item 2) is filed to a pleasing outline and drilled for the pivot; the point should be sharp to facilitate accurate scale readings. Suppose the pendulum were made of 1/16" plywood instead of brass; it would be necessary to secure a little button of lead or solder in the location shown—otherwise the added weight would not be needed. In fact, a metal pendulum so weighted would require too great a pressure from the spring (Item 4) before it would lock when the trap is released.

After the instrument is assembled according to the drawing, the scale is pasted to the protractor. The scale must be positioned so that the "Level Flight" line falls over the vertical centerline of pendulum pivot. Do not use dope for sticking the scale down; it may render the paper transparent. Make adjustments as instructed on the drawing and tighten up all screws; perhaps even going so far as to drop a blob of solder over the last nut on the pivot to prevent it slacking off and allowing the pendulum to wabble. The inclinometer is now ready for measuring glide ratios.

GLIDE RATIO—The operator holds the inclinometer at arm's length in front of his eyes. Keeping the trap open the bar of the instrument is slanted until the model, which has been launched by an assistant, is in a steady glide and appears to be sliding down the slope of the bar (see Fig. 2). At this point the pendulum trap is released and the glide ratio noted from the pointer position on the protractor. Do not confuse the model's angle of

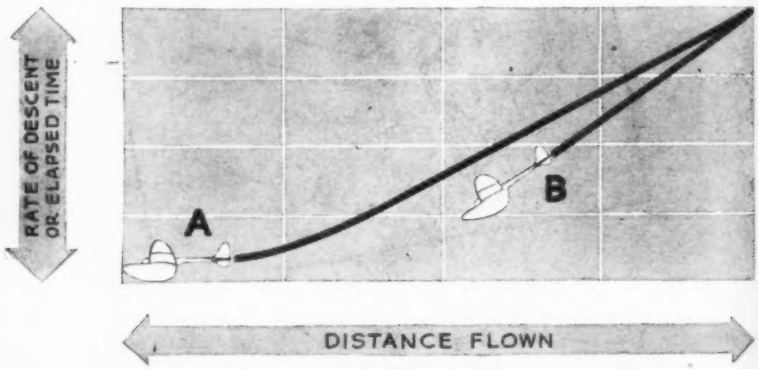

Fig. 4. Comparison of a fast shallow glide and a slow steep glide

attack with its angle of glide. Angle of attack does not enter this picture at all.

If a long slope is available it might be more convenient to fit sights to the bar, rifle style (these can be just made out in Fig. 1), and then follow the descent from a position behind the launcher. This method is not as accurate, however, and is to be regarded as a makeshift. A ball park is an ideal testing ground, launching from the bleachers into the infield.

For reasonable accuracy it is emphasized that the readings *must* be taken when the ship is in a straight and steady glide. Tail heavy undulating flight can obviously lead to gross recording inaccuracies. It is equally important that the launching point is high enough, so that by the time the reading is taken the model has had time to recover from possible poor launching technique, while it still retains sufficient altitude to be unaffected by the glide-flattening influence of "ground effect."

GROUND EFFECT—The generally beneficial effects of close proximity to the ground is usually thought to be due to a sort of cushion of air between the wing and the ground (or water, as the case may be); but that is a careless, incomplete explanation. More precisely, the restricted angle of the wing's downwash is accompanied by a reduction of induced drag, while lift is increased as a result of greater relative air speed caused by the retarding effects of ground friction upon

(Turn to page 44)

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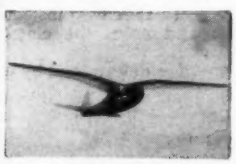

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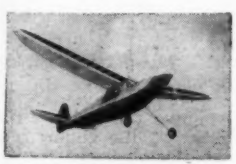

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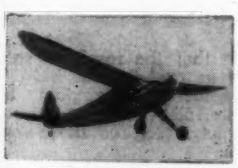

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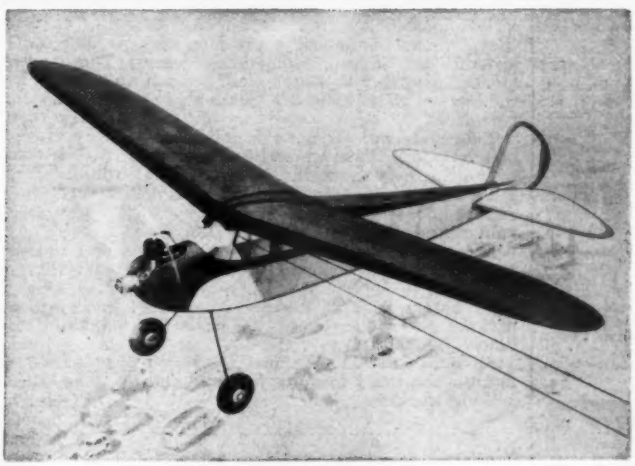

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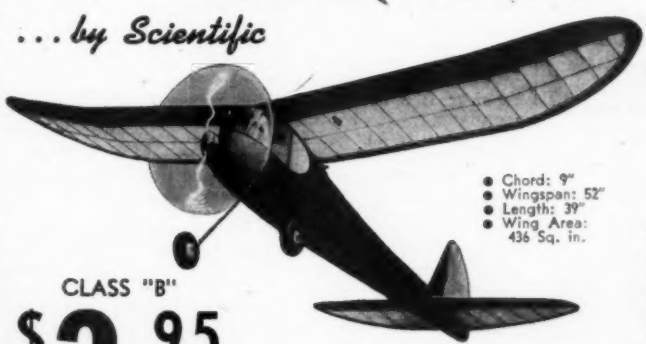

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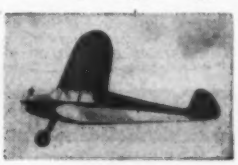

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the mass of air being pushed forward by the aircraft (Fig. 3). It is also thought that the reduced pressure at the trailing edge smooths out the flow over the wing's uppersurface and the net gain is a substantial improvement in L/D_{max}. On full scale airplanes, as a matter of fact, ground effect often permits landing speeds of at least 10% less than the stalling speed at altitude; it is usually considered as coming into noticeable effect at a distance of about half the wingspan above the ground. There appears to be no evidence to indicate that a miniature is not similarly affected. Apparent "stretching" of the glide as the model approaches the ground is, indeed, sometimes very marked, and may to some extent account for some of those allegedly superior performances.

True glide ratio is not the only characteristic to be determined by glide testing; it is only a start. Power driven gliders (which include the average gas or rubber job employing a motor only to gain altitude) and towline gliders are dependent upon the duration of their glide for the greatest proportion of total time in the air. By far the most important design characteristic is, therefore, the rate of descent or *sinking speed*—the lower the better (see Fig. 4).

SINKING SPEED—Reduced to simple figures, the basic formula for minimum sinking speed is:

$$V_{z\,min} = 29\sqrt{\frac{W}{S} \times \left(\frac{C_D^2}{C_L^3}\right)_{min}};$$

Where $V_{z\,min}$ = minimum sinking speed in feet per minute
W = weight of the aircraft
S = wing area
C_D = drag coefficient of the *complete aircraft*
and C_L = lift coefficient of the *complete aircraft*

From this formula, the effects of lift and drag on minimum sinking speed are evident. The sinking speed varies directly as the drag and wing loading, and indirectly as the lift. Therefore, the most efficient model is effectively streamlined, weight is kept to the minimum allowed by A.M.A. rules, and a judicious choice of airfoil section for the proper range of Reynolds Number is of paramount importance. Although this applies to all types of free flying aircraft, it is worth mentioning that a source of drag too often overlooked in gas and rubber model design is the propeller. To reduce airscrew drag, the aircraft industry developed the fully feathering propeller which has blades that can be rotated until they parallel the line of flight. In the fully feathered position the blades will not "windmill," the cause of a somewhat surprising amount of drag. Even so, there are still many serious aeromodelers who remain firmly convinced that they are *improving* performance by fitting a "free wheeler" to their rubber job. Actually, the free wheeling prop is a type of built-in autogyro acting as a very efficient millstone tied around the neck of performance. It becomes virtually a semi-solid disc of the same diameter as the propeller, which naturally requires quite a bit of effort to push along.

Because the nature of a mechanism required to retract a propeller and engine installation is quite involved, the solution is to use a prop which has been designed so that air pressure will fold it snugly back against the side of the fuselage as soon as the motor stops. Gas model "folders," unfortunately, are also extremely dangerous if they are badly made.

Another glance at the formula shows that sinking speed increases as the square root of the weight. Those enthusiasts who advocate high wing loadings on the assumption that a faster and sometimes flatter glide is necessarily more efficient are definitely on the wrong track. Lengthening the glide in terms of distance covered may give an illusion of better performance, but it has nothing to do with keeping the ship airborne for as long as possible. This is shown graphically in Fig. 4.

TESTING FOR RATE OF DESCENT—The determination of sinking speed calls for a crew of four: the inclinometer, a stop watch, a tape measure, and four stakes (bamboo fish poles are ideal and very cheap). The actual setup can be varied to suit the individual and the conditions—Fig. 4 gives the basic requirements.

The aircraft is launched from a height of 20 ft. or more above ground level. The first timing station is set up at a point some 30 ft. along the glide path from the launching point (or far enough for the model to get over the effects of an indifferent launch and settle down to a steady glide). Timing station B is at a measured distance, say 100 ft. from A. Make sure the stakes straddle the glide path at right angles; they should be about 40 ft. apart. The timer lines up the stakes at A, and as soon as the model crosses the "line" he starts the stop watch. The inclinometer reading is taken from a point midway between A and B and 50 ft. away from the glide path. The instant the model crosses station B, an observer signals back to the timer at A who instantly stops his watch and notes the elapsed time.

The sinking speed is determined by the formula:

$$V_z = \frac{d}{rt};$$

where V_z = sinking speed in feet per second
d = distance between sighting stations in feet
r = gliding ratio
and t = gliding time between stations in seconds

For example, suppose the sighting stations are 100 ft. apart, the gliding ratio was 8:1 and the time between stations was 4.3 seconds; then

$$V_z = \frac{100}{8 \times 4.3} = 2.9 \text{ f.p.s.}$$

It is obvious that the results become more accurate as the distance between timing stations increases, providing the model is still well above the influence of ground effect as it crosses the second sighting station.

In making these tests the reader should remember that the air must be calm and preferably cool. Gusts, winds, thermals, turbulent air, etc., will throw the results out. The ship under test should fly as straight a course as possible because there is obviously no use in recording erratic flights. It is also emphasized that these tests do not pretend to give *scientifically* precise results. Such infallible accuracy would call for more exact methods of timing; and temperature, barometric pressure, relative humidity, etc., would also enter the calculations. For the average aeromodeller, however, the described testing procedure is fairly accurate; an

average of four or five flights will provide truly reliable values.

Tests of this nature offer an excellent means of checking the adjustment of any model. The effects of C.G. movement, changes in angle of incidence of the flying surfaces, mass distribution throughout the model, etc., can be determined in their proper light; not necessarily in terms of a faster, flatter or longer glide, but in terms of the most important factor of all, sinking speed.

Throughout this article we have assumed that the reader has digested a number of the words which (as we mentioned at the outset) have been written by others on the mechanics of adjusting. We have only suggested that whatever trimming is done can and should be the result of proper, methodical test procedure. Now we are off to hand glide our latest design. It's a honey—gliding angle fifteen to one . . . dead calm evening. Oops! What *are* we saying!

Cabin Gull Wing

(Continued from page 27)

braces of 1/16" square. Next the tips are added. Construction of the rudder is similar. After both sections are dry take them up and set them aside until needed.

WING AND COVERING—The centersection of the wing is the most meticulous job of all but well worth the time spent. Before starting make templates of ribs 1-A, 2-A and 3-A. Then trace onto a sheet of 1/32" sheet balsa. Cut out the required number and sand to shape.

Now to tackle the centersection. The leading edge is shaped from a medium hard block measuring 3/4" x 1-1/2" x 1/8". To be more accurate a template should be made from the front view on the plans. This is cut out and traced onto the block. Cut the excess wood away and sand to desired shape. The trailing edge is 1/16" x 3/16". This piece should be soaked in hot water. Take the piece between your fingernails and shape to match the leading edge. The spars are done in a similar fashion. Next apply a coat of glue to them and let dry. Prop up the leading and trailing edges with small blocks holding them in place with pins. Glue the ribs in place. After the glue has set add the spars.

When the assembly has thoroughly dried take it up and apply another coat of glue over the leading and trailing edges. The rest of the wing is built in the conventional manner with the exception of the tips. The tips can be shaped as were the spars in the gull section, i.e. by soaking in hot water. When the wing has dried thoroughly put in the dihedral. Pin down the centersection and with the aid of blocks prop up the outer wing portions making sure that each tip has 2-1/4".

FINISHING AND FLYING—Glue the stabilizer and rudder to rear of the fuselage, making sure the stabilizer has 1/16" negative incidence. The wing is held on with rubberbands. For power use 6-8 strands of 1/8" flat lubricated rubber.

Glide the ship several times to attain a flat glide. After the desired glide is attained a powered flight should be tried. Wind about 75 or 80 turns by hand and launch. If the model stalls try giving it some downthrust. Now try another flight. Properly adjusted it should climb out of your hands into a rapid right spiral. Once this point is reached you are ready to go places with your gull. Wind her with your trusty 4-1 winder and if you are surprised at the result don't say I didn't warn you. Good luck!

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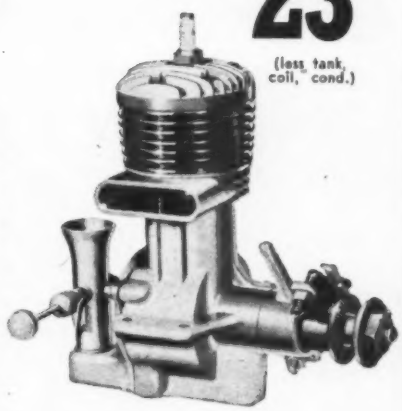

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Mousetrap

(*Continued from page* 17)

Area" has not much to do with it. The amount of side area ahead of the CG does, however, and all ships with a short nose are prone to be critical in respect to spiral stability. *Mousetrap* has more area in front of the CG than most short-nosed ships and is less sensitive to the size of the rudder as a result.

The next most important factor in a good contest model is aerodynamic efficiency. This was achieved in the *Mousetrap* by using a good airfoil section and trimming the ship so it will fly at the proper angle of attack in climb and glide, and by cutting down on the drag. The cowling cuts down much of the parasite drag of this model. Use of a folding prop improves the glide noticeably but cuts down the climb slightly. The proper trim is obtained by locating the CG in the spot shown on the plans. A thin airfoil with a moderate amount of undercamber has been shown to have the best combination of low drag and high lift for use on models. One of this type was incorporated.

One more way to improve the efficiency of a model is to use a high-aspect-ratio wing. An aspect ratio of 8 was chosen for *Mousetrap* because it was desired to keep the overall size of the model as small as possible. Use of an extremely long, narrow wing necessitates a longer fuselage, and first thing you know you have an outsize model with lots of skin friction drag. The AR of 8 used on *Mousetrap* is higher than ordinary, and the results are good.

The third consideration in the design of a good contest model is the workability of any gadgets used on it. Nothing is more embarrassing than to have this dingus or that contraption break or refuse to function just when you have the timer all keyed up for an official flight. The only unusual gadget on this job is the cowling. Considerable thought was given to making it trouble free. The hinges are placed so that the doors stay open when opened, and close with a snap when pushed partway shut. Incidentally, this is why the boys started calling it *Mousetrap*. A retractable landing gear is optional. If your motor has really got soup, you can use one, but much of the time they just aren't practical and bring more gray hairs than prizes.

The last thing necessary for a good contest model is a good contestant who knows how to fly it. In order to know how to fly a model you've got to fly it lots of times. But, whoa! You've gotta build it first.

FUSELAGE—Since all good contest ships are more or less expendable, the construction was kept as simple as it could be with this kind of ship. The main fuselage backbone is a sheet of 1/8" x 2" medium balsa. Mark the centerline accurately on both top and bottom of the sheet, lay off the locations of the formers, square up the front end, trim it to the outline, and lay it over the plans, top side up. Make the triangularly-shaped top formers from 1/16" sheet and cement them in place. The notches in the front where the motor mounts are placed should be spaced to fit your motor. The plans are laid out for a *Forster 29*.

The former at station No. 2 is shaped as shown. The notches in it are cut slantwise in the direction the formers will run when installed. Cement this in place, saw out the firewall from 1/8" plywood and glue it on firmly, giving the joints an extra coat of cement just for luck. The

(*Turn to page* 48)

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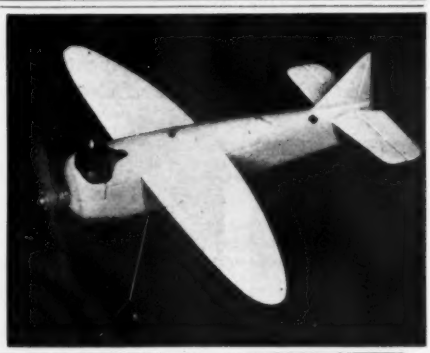

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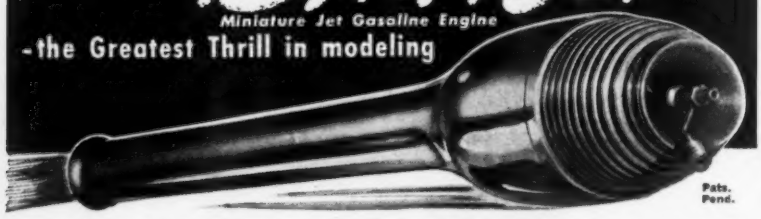

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bottom formers come next. They are most easily made by setting a compass to the radius which will fit the width of the fuselage at the point where they are to be placed, drawing the semicircle, cutting it out with a razor blade, and zippo, you have the formers! The bottom former at station No. 2 is a semicircle with 1/8" added to the top, and the rest are all just semicircles.

Before cementing the bottom formers, put the stringers on top of the fuselage, beginning with the top one and adding the other four afterward. Next make the motor mounts from 1/4" x 3/16" hardwood, and use plenty of cement to hold them extra securely. The wing mount is made from 1/8" sheet and goes on at this time. It must be parallel with the fuselage centerline and have 3/16" incidence. This is important. The 1/8" sheet piece that forms the top of the motor compartment comes next, and should be placed so there is enough room to take the sparkplug out of your motor without removing the motor from the ship. Use 1/8" square strips to hold in place.

The landing gear should be formed of 3/32" music wire and bolted in place at this time, as the planking on the fuselage bottom will hide the bolts. The mounting holes for the motor should be drilled in the motor mounts at this time. Place the motor so the prop clears the front of the wing rubber hook by about 1/4". It is more convenient to shape the inside of the nose block with the motor in place. But keep that sandpaper dust away from your motor if you value its compression! Leave the outside of the nose block oversize until after the planking has been added. The planking is done with strips of 3/32" x 1/4" soft balsa. Sand it (the nose block) and the tail block smooth after it is dry.

The ignition should be installed now, before the 1/16" sheeting is applied to the upper part of the fuselage. Follow the wiring diagram on the plans. The flight timer is mounted to a piece of 1/16" plywood that fits between the firewall and station No. 2. This piece of plywood is cemented only at the corners so it can be removed when it is necessary to get at the wiring. The timer should be mounted on the opposite side of the ship from the motor exhaust so that oil will not get in and foul up the points. The internal mounting keeps the timer points clean, but must be done carefully because they are not easy to get at afterward. The coil is mounted on the main fuselage member in a hole cut to fit the particular make you are using. Be sure it is in there firmly and won't jiggle out. The condenser is bolted to the rear of the firewall. This same bolt is the terminal for the lead from the negative pole of the batteries, and a wire runs from it to the motor, completing the ground circuit.

Make the cowling hinges as shown by the plans. A good sturdy job is necessary here as the hinges must take considerable strain at times, and they can be a bother if they don't work right. Cement them firmly to the rear of the firewall before you add the sheeting. The cowling itself is made in one piece and fitted in place, then split into halves. Carve the front piece from a piece of 1/2" x 2" balsa, pin it in place, then build up the top former and sides from 1/16" sheet. You just have to work around a bit with this piece, but cheer up, it's the only hard part about the model. The air outlets should fit snugly against the hinges for a strong joint. The finished cowling is taken out of its place and the top former is split into three pieces, as shown. The center piece is ce-

(*Turn to page 50*)

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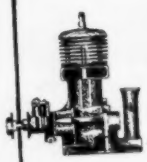

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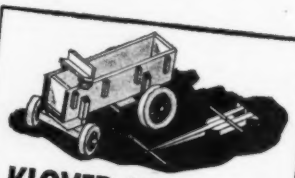

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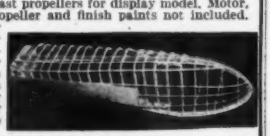

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mented to the underside of the motor compartment roof to act as a positioner and stop for the cowling doors.

Give the cowling and other parts around the motor compartment several coats of dope as oil-proofing. There should also be a drain hole in the bottom of the nose block just ahead of the firewall to drain off the excess goo that would otherwise accumulate and be a fire hazard. Lastly, go over the entire fuselage with fine sandpaper to take off lumps and pieces of cement which would make a neat covering job difficult.

WING—Begin by cutting out the ribs. There are 28 ribs cut from 1/16" sheet, and three of 3/32" or 1/8" sheet. The thicker ribs are put at the dihedral joints where the shrinkage of the covering tends to pull the airfoil out of shape. An easy way to duplicate ribs is to cut out 26 pieces of 1/16" sheet a little longer and wider than the finished rib, then cut out two ribs very accurately. Pin the rib blanks into a neat stack, and pin the two cutout ribs at either end of the stack. With a knife and sandpaper trim the stack down to the rib outline, put in the notches for the spars, and when you remove the pins you have 28 accurate ribs. Note that the three ribs in the center of the wing are narrower than the rest of the ribs to allow for the 1/16" sheeting. The three 3/32" ribs are cut separately.

Carve the leading and trailing edges to shape and pin them to the plans. The front of the trailing edge should be raised 3/32" higher than the rear to preserve the airfoil shape. Next add the ribs, with the ribs at the dihedral joints set at a slight angle to make a better joint. The three tip ribs are smaller than the rest, but this is easy. Just wait until the rest of the ribs in each tip section have been added, then cut enough from each of the three remaining ribs so they are the right length to fit in their proper place. Lastly slice enough from the bottom of each so they will be approximately the right thickness. The exact shape of the airfoil is not very important, the main thing is to see that the airfoil gets thinner toward the tips. The wing spars are cemented in place after the frames have been removed from the plans.

The leading and trailing edges are all butt-jointed at the dihedral points. Trim them to make a good fit as otherwise the cement, which shrinks as it dries, is likely to pull the trailing edges out of line and deform the airfoil. Cement the four wing sections together, using plenty of cement at the butt joints at the leading and trailing edges. The sheeting is done with medium soft balsa sheet 1/16" thick, sanded to make a smooth job. Go over each leading and trailing edge joint two or more times with thick cement to assure a good strong joint at each place. If you do this you won't have to go to the trouble of making gussetts.

TAIL—Construction of the elevator and rudder is similar to the wing. Build rudder and elevator separately and join after you have added the 1/32" sheet to the center part of the elevator. Note how the elevator and rudder spars are jointed.

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(*Turn to page* 53)

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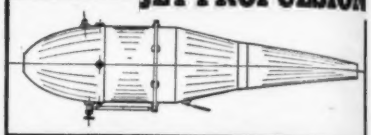

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you decide to use heavier covering on this model do so with caution as it will probably change the center of gravity, for which you will have to make allowances.

Cover the entire ship, including the sheeted parts. Both inside and outside of the cowling should be covered. Apply the tissue so the grain runs the long way of the piece being covered; that is, the grain should run spanwise on the wing, lengthwise on the fuselage, etc. In covering the wood parts, the grain of the paper should run crosswise to the grain of the wood to aid in keeping the wood from splitting.

Covering with tissue is done dry. Spread plenty of dope around the edges of the part to be covered and smooth on the tissue, taking out as many wrinkles as you can in the process. After the dope is dry, spray the tissue lightly with water and very few wrinkles will remain when it dries. In covering the undercambered bottom of the wing it is necessary to coat the bottom of each rib and spar with dope to get the tissue to follow the shape of the airfoil.

FINISHING—Give the wing and tail a coat of clear, a coat of color, and a coat of clear dope. The fuselage should have a coat of clear, two coats of color, and a final coat of clear. It helps if the color of the tissue and dope is the same. The color scheme may be any combination desired. Yellow wings and elevator, and red fuselage and rudder gave the original high visibility.

FLYING—Now comes the exciting part, but keep your head, Bub. Before you take the ship out of the shop check up *very* carefully on the lineup of all parts. There should be no warps. If there are, take them out now as you will have to eventually. The wing and elevator should line up when viewed from the front, and the rudder should be set for a very slight left turn. The wing should have 3/16" incidence and the stab should be set at approximately zero. The model should weigh 24 oz. and the CG should be 1" ahead of the trailing edge of the wing. No thrustline offset should be present. Only after you are sure all these conditions are satisfied should you try even the teeniest-weeniest test glide.

Several test glides should be made before trying a power flight. The main thing to watch for is a stall. Something that looks like a slight stall in a test glide may turn out to be disastrous after a power run. Watch for any tendency of the model to flatten out and lose speed as this is a good indication of an incipient stall. If such is present and the CG is in the right place, correct it by adding a slip of 1/32" or 1/16" balsa under the front edge of the stab. Any diving tendency should be corrected by adding incidence to the front edge of the wing, *not* by raising the trailing edge of the stab. There should be no noticeable turn in either direction. If there is, look for warps, or an out-of-line fuselage. Turn should be taken out before trying any power runs.

Now start your motor. It will start easily, of course, because you have been very careful with your wiring. With the spark fully retarded and the motor barely two-cycling, launch the model just as you would when gliding it. It should assume a slow climb with maybe a tendency to turn right. This tendency will increase as the power is increased, so gradually add left rudder to keep the flight path straight in the climb. Use a straight climb on *Mousetrap;* it is built to go up that way. A model that uses no circle in the climb will fly faster, not hanging on the prop, and get up higher because it is not

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3/32 sq. ....3 for	4c	5/32x2	12c
3/32x3/16	2c	3/16x2	14c
3/32x1/4	2½c	1/4x2	16c
3/32x3/8	3c	5/16x2	18c
3/32x1/2	3½c	3/8x2	20c
1/8 sq. ....3 for	5c	1/2x2	22c
1/8x1/4	2½c	1/32x3	10c
1/8x3/8	3½c	1/16x3	12c
1/8x1/2	4c	3/32x3	15c
5/32 sq.	1½c	1/8x3	19c
3/16 sq.	2c	3/16x3	22c
3/16x1/4	3c	1/4x3	25c
3/16x3/8	4c	3/8x3	30c
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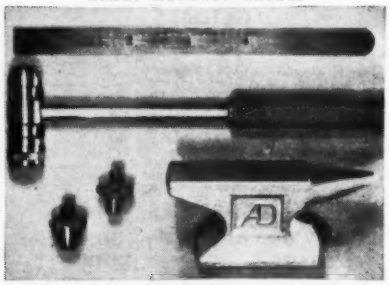

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MODEL AIRPLANE NEWS

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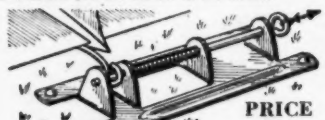

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fighting centrifugal force and gravity at the same time.

If the model glides OK but tends to hang on the prop, move the CG back a little, re-trim the glide by adding a little incidence to the front of the elevator, and try it under power again. Similarly, if the ship keeps its nose too far down, move the CG forward and re-trim. As you increase the power, *Mousetrap* should respond by sticking its nose higher and higher until it is climbing at a 70-80° angle under full power and really getting up there in a hurry. The left rudder should take effect in the glide, 150' left circles being about right. The glide should be flat and fairly fast. If there is a tendency to mush, the sinking speed will be considerably greater. This should be eliminated by moving the CG forward, adding incidence, or a judicious combination of both. Remember, though, one thing at a time!

We are sure you will like your *Mousetrap*. It has been a lucky ship for the author. At a time when the motor in this ship was the only one the author owned, the ship was lost four times out-of-sight at contests. Once it lay in a field for a month. Yet each time it was found and returned. Seems to have nine lives. During all this exposure to the elements, the motor never suffered even a speck of rust as the cowling kept it protected. The worst that happened to it was at Clarksburg when the grasshoppers made several hearty meals of tissue and balsa. Better make sure your name and address are on the ship and that your motor is registered with the AMA, though, for this job likes to catch thermals.

Design Forum

(*Continued from page 22*)

Data obtained from these experiments assure us that gas-powered autogyros can be developed without trouble provided certain factors are incorporated in its design.

John E. Toomer of the *Star Dusters Model Airplane Club*, Pasadena, Calif., is one of the experimentally minded who has become intensely interested in gas-powered autogyros. He sends plans of an autogyro, Fig. 1, which he believes will operate successfully. The plans do not cover all the factors required for this type of craft but at least they indicate that the inventive and experimental genius has not totally departed from the model field. In light of the experiments we have made with towline craft, we are happy that we can supply some definite information concerning the design of powered craft. Though there is a great deal more to learn we hope that the few following suggestions will prove helpful.

Mr. Toomer intends to use an *Arden .09* engine. Therefore, the total weight of the craft will probably be in the neighborhood of 1 lb. It may be possible to construct it as light as 12 to 13 oz. but this would be remarkable. To carry this weight he specifies a rotor of 36 in. diameter. This may be a little small. The towline model had a rotor span of 26 in. and weighed 4 oz. To this weight the pull of the string must be added because the center of gravity was to the rear during most of the tests. The vertical component of this pull did not exceed 2 oz. at the most, making total lift of the autogyro 6 oz. If the powered autogyro is to weigh 16 oz. then the area of the circle swept by the rotors should be 2⅔ times the area of the towline rotor

circle. This means that the diameter of the rotor should be in the neighborhood of 45 in. Mr. Toomer's model indicates a four-bladed rotor; this number of blades was also used on the towline model.

One of the first and most important points discovered in model autogyros was that full scale values cannot be applied; for instance, the angle between the plane of the rotor and the stabilizer must be much larger in a model. The best results with a towline model were obtained when the stabilizer was set 19° to 20° negative to the rotor plane. When this angle was reduced the rotor's side thrust increased tremendously. This side thrust tends to roll the autogyro over to the right when the rotor turns to the left—that is, the advancing blade is on the right and the retreating blade on the left.

Mr. Toomer shows a difference in angle of only 2° between the rotor plane and stabilizer. We believe this is far too small and that the angle must be increased to at least 10°. Smaller angles can be used if the blades of the rotor are freely hinged. Flexible springs were used on the towline models and we found that the side roll tendency increased when the stiffness of the springs was increased. In other words, the more rigid the blades the more tendency there was to roll sideways. Free hinge rotors were not used for a very definite reason. It was found that the turning inertia of the rotor was very small compared to the turning resistance or drag. Therefore, at times during flight and due to gusty air or other unaccountable conditions the rotor would slow down and nearly stop. This would reduce the centrifugal force that held the rotor blades out straight against the upward lift forces, with the result that the blades would turn up at a sharp angle spilling out the air. With this, rotation would cease completely and the model would drop.

To correct this condition it was obvious that one of two things had to be done: either the rotor blades had to be fixed so that they possessed some degree of flexibility, yet were stiff enough to resist a high degree of upward bending; or the blades had to be increased in weight until sufficient centrifugal force was produced, when spinning slowly, to hold the blades down against the lift forces. The first method was chosen, with complete success for the towline model. Flights as high as 100 ft. were obtained, the length of the string being the only factor which limited the height that might have been obtained.

We suggest that in the experiments a combination of these two factors be used: first that the rotor blades be mounted on light steel springs so they can flex upward readily with little resistance; second, that weights be added to the tip of each rotor blade so they will have added spinning inertia and will not cease to rotate with every air gust striking them. This latter condition is the one factor that has been stalling the development of model autogyros. The inertia of the rotors of full scale craft is large compared to their drag. Due to the comparatively small diameter of model autogyro blades their inertia is slight, and therefore weights must be added to the tips to increase it. These not only keep the rotor spinning but contribute additional centrifugal force that prevents the blades from flexing upward to extreme angles.

Weighting the wing tips was one of the methods tried in our tests; but we found that this tended to keep the plane of rotation in a fixed position and to resist

(*Turn to page 58*)

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Plastico Rok is used extensively as a paint base or undercoat. The Rok penetrates the pores of the wood and gives a hard smooth finish when sanded that will not chip or peel. First warm the tube or can of Rok. Next you thin the Rok with a very little warm water so that you can brush it on smoothly. Allow to become bone dry then sand to a plate glass finish. Use fairly coarse sandpaper first and finish with "00" sandpaper. For flat surfaces it is best to use sandpaper on a small block of wood. It is best to use the same color Rok for the undercoat that you will use for the finished coat. The Rok undercoat absorbs brush marks insuring smooth finish.

ADHESIVE

Plastico Rok is peerless among adhesives . . . Model builders who once use Plastico Rok never buy another type of adhesive. Plastico Rok readily adheres even to glass and metal surfaces. For Household uses, too, it settles into cracks, joints, or surfaces and permanently welds them into solid constructions.

ROK IS MADE IN WHITE AND 12 PRACTICAL COLORS:

Red	Orange	Olive Drab	Green	Light Oak
Blue	Dark Oak	Battleship Grey	Yellow	Mahogany

Standard 3-Oz. Tubes ..... $ .30
¼-Pt. Can Approx. Wt. 8 Ozs. ..... .45
UTILITY KIT 7 ASST'D COLORS—30c tubes 1.95

See your dealer first—or remit for colors needed. Add 10 per cent for postage. Please name colors.

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National Distributor to the Hobby and Toy Trade

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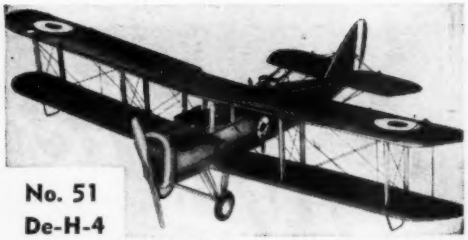
¼" Scale Solids

New Kit procedure and plan plus

1. Plastic Vickers Machine Guns
2. Plastic Lewis Machine Guns
3. Plastic 2-blade World War 1
4. Plastic 4-blade World War 1 Propeller (where required)
5. Plastic Wheels
6. Metal Bucket Seats
7. Strut Sticks, Sheet Wood and Sandpaper
8. New Boxes. All Balsa parts sawed to outline shape.



No. 51
De-H-4

ALL 50c

No. 53—FE-2-B
No. 52—SE-5
No. 50—Sopwith Camel
No. 54—Spad-13
No. 55—Nieuport-17
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Manufacturers of Solids since 1928

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- QUICK DRYING
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SPECIAL
AEROPLANE GLUE

10¢

You can make a flock of planes with this water-white, transparent, light-as-a-feather glue. It won't stain any woods . . . sets *quickly!*

MORE NEW MOTORS!

AS WAS expected when we published our "Model Motor Symposium" in the December 1946 issue, it was not even on the stands before many new motors had reached the market. The latest additions are described in Mr. Ingram's article in April

MODEL AIRPLANE NEWS

On Sale at All Newsstands March 11th

BIG Assortment GUNS & BOMBS 25c

Postage 8c Extra

Special big assortment of 10 die-cast finely detailed BOMBS and GUNS

BLOCKBUSTER 8c
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PROPELLERS STANDARD TYPE Die Cast White Metal

ALUMINUM Adjustable Pitch

7½"	.25
8"	.30
10"	.35

ALUMINUM Tubing .010 Wall per foot

1/16"	.12
3/32"	.12
⅛"	.12

2 Bladed

1½"	No. 13	.05
2"	No. 14	.07
2½"	No. 15	.08
3¼"	No. 16	.10
4"	No. 17	.12
4½"	No. 18	.15

3 Bladed

1½"	No. 25	.08
2"	No. 26	.10
2½"	No. 27	.15
4"	No. 28	.20
4½"	No. 29	.25
5"	No. 30	.30

Spinner Type

3¼"	No. 1	.18
4"	No. 2	.20
4½"	No. 3	.22
5"	No. 4	.25
5⅝"	No. 5	.30
6"	No. 6	.35

4" No. 7 .25
4½" No. 8 .30
5" No. 9 .35
5⅞" No. 10 .35
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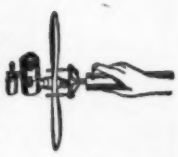
The **SPINIT** GAS MODEL STARTER *It's Super!*



Completing your equipment with a SPINIT brings added flying pleasure. Features include fingertip automatic safety release, rubber cushioned drive, steel-spring powered. The SPINIT is *just* what you need to make model flying more fun.

IF IT WILL RUN, A SPINIT WILL START IT

More fun, more thrills—with a SPINIT. Standard for A & B motors. Heavy for C motors. Two blade models, short or long drive, $4.00; 3 blade models, $6.00. Write for folder. Order from dealer or direct.

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Now,

GREATER EFFICIENCY, MORE POWER!

WITH THIS NEW

Supercharger

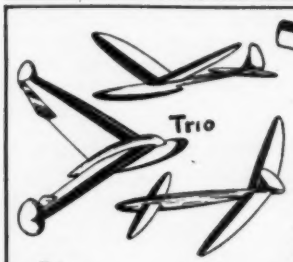
Precision Built, Thoroughly tested
Weighs Only 1¼ oz.
Designed For All Model Engines

COMPLETE UNIT

With All Attachments Necessary $3.00

If Ordering From Iowa, Add 2% Sales Tax

K and S CO.
1600 24th St. PL. Des Moines, Iowa



For fun and records fly JASCO Thermic gliders

Thermic "18"	Wingspan 18"	20c	add 5c	P.P.
Thermic "20"	" 20"	35c	add 5c	P.P.
Thermic Trio		35c	add 5c	P.P.
Trooper Class "C"	" 36"	65c	add 10c	P.P.

See your dealer first. Send your address for free Catalogue.

SPECIAL T-56 BROWN CONTEST RUBBER

Identical to pre-war T-56. Made by U.S. Rubber Co. If you have used it before the war, you know what it is. If you have only heard about it, now is your chance to see what it has that made the boys pine for the "good 'ole brown." As during the prewar days, JASCO is taking safety precautions to make sure that you receive T-56 in best possible condition. Immediate delivery on 3/8th.-3/16.

PRICE: ⅛ flat to 10 ft.—10c. 3/16th flat 10 ft.—15c
JASCO Rubber Lube 1 oz. 17c, 3 oz. 35c.

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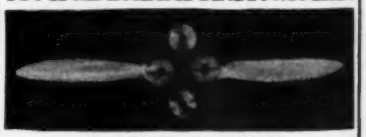
JOYCE REPLACEABLE BLADE PROPELLER



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8" prop $1 10" prop $1.30 11" prop $1.45

Individual blades are replaceable at low cost:

8" blade 30c 10" blade 40c 11" blade 45c

Hubs 25c per pair Bushings 10c each

Buy from your dealer or order direct, giving dealer's name.

JOYCE PRODUCTS, INC.
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*Horsepower absorption curves available on request.

First with Phantom!

• A LIGHTWEIGHT CAST IRON PISTON FITTED TO A HARD CHROME CYLINDER WALL—an exclusive PHANTOM combination that HOLDS COMPRESSION at any TEMPERATURE AND SPEED! For EXTRA LONG LIFE, EASY STARTING, and SPEED TO SPARE, the New 1947 Phantom P-30 is head of its class. Order yours now! Immediate Delivery!

MFD. BY AUTOMATIC SCREW MACHINE CO.

P 30 SPECIFICATIONS

Displacement . . .295 cu. in.
Bore . . . . . .711 in.
Stroke . . . . . .750 in.
Horsepower . . . 1/5
Rated Class "B" Under NAA Rules

STILL 14.95
COMPLETE WITH COIL, CONDENSER, GAS TANK, AND SPINNER

SEND FOR ILLUSTRATED LITERATURE . . . IT'S FREE!

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806 East Gage Avenue, Dept. B 3 , Los Angeles 1, Calif.
Please send me a New 1947 P-30; as checked below:
☐ with Coil, Condenser, Gas Tank and Spinner $14.95
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Designed by Bev. Smith

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SLICK CHICK

...and FAST TOO,

The first free flight model designed especially for the ARDEN .099 power pack and engine, and also adaptable for .099 engine with conventional ignition installation. Features unique construction with many pre-cut and pre-formed parts, lowering construction time to less than ten hours. Slick Chick has proven flight ability. Available at your dealers beginning February. COMPLETE KIT $4.95

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MODEL

LOOK LOOK LOOK

- ICE BOAT—Speeds faster than race cars on wooden tracks and gym floors.
- ICE BOAT—Not only limited to ice and snow but will—speed on grass, sand and any level ground with the use of wide skiis.
- ICE BOAT—Is also adaptable for pontoons, can be converted to boat racing craft.
- ICE BOAT—Uses any A, B, or C engine with ample room for coil, condenser and batteries. Overall length approximately 20".

SPEEDS OF 130-140 MPH

CHALLENGER perfect with PLASTIC WOOD

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strongly any rotation of the aircraft due to gusts. Also when the craft did turn the blades traveled a crazy pattern, often bending downward to such an extent that they would strike the sides of the body. This condition alone was produced by the added weight at the tips.

It was corrected by extending fingers outward from the center axis under the stem of each rotor so that the blades were free to swing up but were restrained from swinging downward. After this no trouble was encountered.

The type of blades used on the rotor is important. First of all, the necessity of a high lift wing section is indicated by our tests. Rotors of both constant angle of incidence and varying angle were tried and it was found that the latter rotors operated more efficiently. The angle of the rotor blade at the blade root was set at —10° to —12° to the plane of rotation. The angle of the blade at the tip was only about —4°. The blade from root to tip varied in angle gradually between these two values, creating in effect a spiral blade. This negative angle of incidence, however, is related to the angle between stabilizer and rotor. The negative angle of the blade at the root was approximately 60% of the angle between plane of rotation and stabilizer. If the latter is only 12° instead of 20° then the root angle of the blade should be —7° to —7½°. At the tip the angle should be about —3°.

Unless these conditions are right the plane will not fly at all. Other conditions are required for stability in flight. For instance, we found it necessary to attach the towline at a point, considered vertically, which was on a line passing through the center of gravity and center of vertical tail surface. When the string was attached above this line the plane oscillated; when below it would turn off to one side and dive in.

This may not occur in free flight gas powered craft. However, it may be well to take this condition into account and place the propeller hub at a point on this line through c.g. and center of vertical surface. This does not mean that the thrust line must be parallel to it. In fact, we believe the thrust line must be approximately parallel to the stabilizer. You may find that this varies a few degrees with different autogyros just as it is possible to vary the thrust line of a gas model a few degrees relative to its stabilizer.

It may be necessary to offset the stabilizer to overcome the rotational effect of the side thrust on the rotor. In the towline model two-thirds of the stabilizer extended to the right, only one-third to the left. Special means of attaching this towline had to be devised to overcome this rotational effect in conjunction with this offset stabilizer. However, this problem may not enter the flight of a powered craft. Any rotational effect to the right will be partly if not entirely overcome by torque reaction of the propeller. With the rotor turning so that the blades retreat on the left side, the torque of a normal right-handed propeller tends to overcome the rotational effect caused by the rotor.

The gyroscopic action of the propeller often causes the tail of a normal airplane to swing to the left while banking to the left. This action in the case of an autogyro also is corrective because under torque effect of the rotor the tail has a tendency to swing to the right with the rotor. The gyroscopic effect of the propeller tends to neutralize this swing. So there is no reason why a gas-powered

(*Turn to page* 61)

MEGOW ANNOUNCES

The Competitor...

The FINEST U-Control...

DESIGNED AND FLOWN BY MAT KANIA

UC-5
$5.50

(Lic. under J. Walker "U" Control Pat. No. 2,292,416)

A brand new kit featuring the best carved fuselage obtainable, shaped leading and trailing edges, wing tips, rudder and stabilizer. Formed landing gear, plywood bulkhead and all metal fittings. Grade A Balsa used throughout. Clear, easy-to-read Plan and Instruction Sheet . . . easy to follow. 26" wingspan. 21" length. 22 oz. flying weight.

A real CONTEST WINNER for engines of .30 to .60 cubic inch displacement.

OTHER MEGOW U-CONTROL MODELS

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Skyway's Plane Talk

Free DELIVERY in U.S.A.

24 HOUR SERVICE GUARANTEED

BALSA SHEETS—2x18

Bass or Pine Cost 1½ Times Balsa
2 x 36 or 3 x 18 cost 3 times
3 x 36 or 4 x 18 cost 5 times
4 x 36 or 6 x 36 cost 7 times
3 x 60 costs 8 times—4 x 60 10 times

1/64	5 for 10c	5/32	3 for 10c
1/32	5 for 10c	3/16	3 for 10c
1/32	3 for 10c	1/4	2 for 10c
1/16	5 for 10c	5/16	2 for 10c
5/32	4 for 10c	3/8	2 for 12c
3/8	4 for 10c	1/2	2 for 12c

18" BALSA STRIPS

36" costs double. Sizes with * come in 60" too. Cost 5 times 18". Minimum order on 60"—$1.00.

1/16 sq.	20. 5c	3/16x3/8*	3. 5c
1/16x1/8	10. 5c	3/16x1/4*	2. 5c
1/16x3/16	7. 5c	3/16x3/4*	4c ea.
1/16x1/4	6. 5c	3/16x1*	4c ea.
1/16x3/8	6. 5c	1/4x1/4	3. 5c
1/16x1/2	5. 5c	1/4x3/8*	3c ea.
3/32 sq.	10. 5c	1/4x1/2*	2. 5c
3/32x3/16	7. 5c	1/4x3/4*	3c ea.
3/32x1/4	5. 5c	1/4x3/4	4c ea.
3/32x3/8	4. 5c	1/4x1*	4c ea.
3/32x1/2	3. 5c	5/16 sq.*	3. 5c
1/8x1/4*	3. 5c	5/16x3/8*	5c ea.
1/8x3/16*	7. 5c	5/16x1/2	4c ea.
1/8x1/2*	5. 5c	3/8x3/4*	5c ea.
1/8x3/4*	4. 5c	1/2x1/2*	5c ea.
1/8x1*	3. 5c	1/2x3/4*	6c ea.
1/4x1*	3c ea.	1/2x1*	2. 15c
1/32 sq.*	4. 5c	3/4x3/4*	2. 15c
3/16 sq.*	4. 5c	3/4x1*	2. 15c
3/16x1/4	4. 5c	3/4x1*	6c ea.

18" BALSA PLANKS

36" Costs Double, 60" Triple

1/4x3/4	.06	1x6	.45
1x1	.08	2x2	.30
1 1/2 sq.	.10	2x3	.45
1x2	.15	2x4	.60
1x3	.25	4x4	1.25
2x6	.90		
3x3	.75		
3x6	.95		
3x6	1.35		
4x6	1.65		

NOSE BLOCKS

1x2x1	5c	2x4x5	15c
1x2x2	2c	2x5x5	17c
1x2x6	5c	2x6x6	25c
1x2x3	4c	3x3x3	10c
1x3x6	7c	3x3x6	19c
2x2x2	3c	3x6x6	40c
2x2x3	5c	4x4x4	27c
2x3x3	7c	4x4x6	45c
2x2x6	10c	4x6x6	60c

PROP BLOCKS

1/2x3/4x5	2c
1/2x3/4x6	2c
5/8x1x8	3c
3/4x1 1/4x10	3c
3/4x1 1/4x12	4c
1x1 1/2x12	7c
1x1 1/2x15	10c
1 1/2x1 1/2	15c
x18	15c
1 1/2x2x18	18c

36" TAPERED TRAIL. EDGES

3/32x3/4	.3c	3/16x3/4	.6c
1/8x1/2	.4c	5/32x1/2	.7c
5/32x3/4	.5c	1/4 or 1/16x1	8c

Also in 8 ft. at triple these prices.

BAG O'BALSA $3 VALUE—$1.00

Sent express collect, NO Packing charge. PLANKS & BLOCKS up to 20 pcs. Approximately 2" thick, 3" to 4" wide, 1" to 12" long.

PROPS

Balsa Special Rubber 9" U-line Powered
4 for $1
Pitch
dai. Exp. Col. 2.98

6"	4c
7"	7c
8"	8-10-12"
9"	7c
9"	8c
10"	9c
11"	x
12"	10c
13"	x
14"	12c
15"	15c
16"	15c
18"	25c

.35-.45	
.35-.45	
.40-.55	
.40-.50	
.46-.60	
.45-.60	
.50-.65	
x	
x	
x	

PLASTIC

2bl 3bl 4bl
2c 10c 10c
3c x 15c
3c 15c x
5c 15c 20c
10c 20c x
15c 30c 30c
20c 50c x

CEMENT, CLEAR DOPE, THINNER,

1 oz. 8c, 2 oz. 15c
½ pt. 40c, pt. 65c
dai. Exp. Col. 2.98

COLORED DOPE

10 Asst. Colors

MICROFILM, WOOD FILLER or LIQ. CELLULOID

1 oz. 9c, 2 oz. 15c
½ pt. 50c, pt. 75c
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PLASTICO ROC 25c

3 oz. 8 asstd. cols.

PLASTIC WOOD

¾ oz. tube 10c

MOLD-EX

Mold Plastic Parts
½ pt. 55c; pt. $1.00

SILKSPAN, white.

3 sheets for 25c

A. A. TISSUE

10 Assorted Colors, doz. 35c

NYLON Plane Covering. Parachute Quality, 98c sq. yd.

SPRAY GUN 98c

Heavyweight.
2 jars.... $1.98

RUBBER WHEELS

1/2"	3c pr.
5/8"	5c pr.
3/4"	6c pr.
7/8"	7c pr.

PLASTIC WHEELS (Lightwt) per pr.

1"	3c	1 1/4"	4c
1 1/2"	5c	1 3/4"	7c

WE STOCK ALL WORTHWHILE ADVERTISED KITS and SUPPLIES

GAS ENGINES *With Coil & C'denser
*MERLIN SUPER 'B'.....$18.00
Atom A .099.....15.50
*Arden .099 Plain 19.50, B.B. 22.50
Bantam A .199.....18.50
DeLong B.....19.50
Hornet C 60 Ball Bearing.....35.00
McCoy C Ball Bearing.....35.00
Madewell C.....18.00
Contestor C, Rotary Valve.....28.50
Ohlsson '23" 16.50; "60" C.....18.50
OK Super 60 18.00; B29.....15.50
Super Cyclone C, Single Ign.....22.65
Shulman's Diesel Drone 'B'.....21.50
Super Cyclone C, Dual Ign.....23.40

We stock motor parts

SUPER PLANS $1.00 Pack CONTROL LINE 1"=1' Any Class "B" or "C"

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Typhoon
Vought Corsair
Spitfire IX
Focke-Wulf 190
Mustang P51

PACKET NO. 11
Hellcat P6F
Airacobra
Curtiss F40
Zero
Thunderbolt

PACKET NO. 12
Hawker Tempest
P38 Lightning
Kingcobra
Deathless SRDS

PACKET NO. 13
Spad Fighter
Fokker DV11
Sopwith Camel
Nieuport 17C1
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PACKET NO. 14
Piper Skycycle
Globe Swift
Ercoupe
Johnson Rocket
Culver Model V

PACKET NO. 15
Gee Bee Racer
Fokker Racer
Wendell Williams
Roscoe Turner
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ANY CLASS "A" or "B"

FOLIO NO. 1
Knight Aviator
Tethered Trainer
Helldiver
Hep Cat
Conn. Yankee

FOLIO NO. 2
Hall Racer
'Ill Special
Gee 38
Culver Cadet
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FOLIO NO. 3
Stahl's Creature
Bob Cat
Flying Lab
Copperhead
Could Be

10 AIRFOIL SECTIONS $1.00 Packet
3"-12"—444 SIZES - - -

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Champion Spark Plugs ½ or ¼ 50c
Solderless Plugs or Tip Jacks ea. 15c
Battery Boxes—sm., med., Lge. 45c
Motor Mounts—aluminum; Med. 40c
Adj. motor mounts.....$1.50
Condensers, best qual. 20c; Metal 35c
Terminal Clips ⅝" 10c val. 3—5c
Spaghetti Tubing 1/16" 2 ft.—10c
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SAE 70 Oil—½ pt. 35c, Pint 50c; Skyway Hot Fuel per pt. 75c; per qt. $1.25
12" High Tension leads—Best—15c
18 strand Hook-up wire 3 ft. 5c
20" Booster Leads Special...Pair 59c
Masking Tape ¼x36"—Instructions 5c
Alligator Clips, Pee Wee, each 10c
Neoprene tubing 3/32" opening 25c ft.
Plywood—1/16, ⅛, 3/16, ¼ 50c ft.
Universal Plug Wrench 25c; "U" tank 2.50; Brass Fly Wheel 1.50; Swivels Class A 15c pr. B, C 20c Bell crank 10c; Elevator hinge, 4 for 10c.

"U" LINE WIRE

7 strand, flexible, kinkless, stainless steel 150 ft. coil 2.25; 100 ft. 1.75
100 ft. spool single strand 49c; Universal N'dle Valve 75c; Flex. 1.00
Walker "U" Reely Control 7.50

GAS MODEL WHEELS

OILPROOF Alum. Hub
Neoprene Sponge
1½" pr.....35c
2" pr.....40c
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PLASTIC SPINNERS
1¼" 25c 1¾" 45c
2" 55c 2½" 65c
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.020 .028 3 ft. 2c
.034 .040 3 ft. 4c
.059 1/16" 3 ft. 5c
3/32".....3 ft. 15c
⅛".....3 ft. 20c

RUBBER POWER ACCESSORIES

Contest Rubber:
T-56, 2c ft.
8" Band 2c ea.
½" Pins—50 5c
6x10 Cellul. 10c
¼" Washer 5c ea.
Ball B'g Wash 10c
4 Shts. Sandp. 5c

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Small 6c Lge 10c

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Small 4 for 5c
Medium 3 for 5c
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24 PLANE PHOTOS 15c

ALUM. TUBING per foot

1/32 or 1/16 8c
3/32 or ⅛.... 10c
3/16 or ¼....15c

ALUM. ANGLE

½x½x12" ft. 25c
¼x¾x12" ft. 35c

Sheet alum. per ft.
.003-.005.....25c
.010 .....35c
1/16 3x12....35c

Alum. Foil, clean, shiny, for covering, per ft.....15c

HAIR BRUSHES

Small 8c; Med. 10c; Lge. 15c;
G.M. 25c

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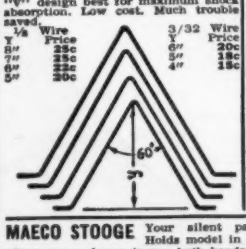

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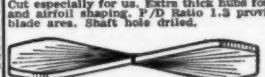

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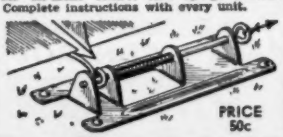

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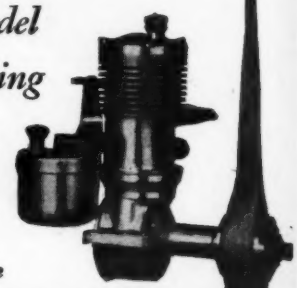

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autogyro will not fly more or less on a straight course. It may be found that not even the offset stabilizer will be required because of the propeller torque. It is advisable to set the rotor blades at a slight dihedral, each blade at approximately 9° when they are at rest.

The c.g. should be slightly forward of the axis of the rotor so that when the motor cuts the craft will nose down slightly and settle through a combination of glide and autogyro action. Without question a gas-powered autogyro will come down slowly and gently without crashing, provided it has its factors arranged in such a way that it will climb to a reasonable altitude. The towline model could be maneuvered with the string to land so gently as to make it impossible to tell when it is on the ground. By increasing the pull on the string slightly from time to time while settling, the descent was checked and it would hover without sinking.

We do not pretend to say that these are all the problems connected with gas-powered autogyro flight. We merely offer these as suggestions because they are the result of definite experience with this type of craft. Many other problems undoubtedly will be encountered which must be solved. If this were not so, experimenting with flying autogyros would cease to be interesting. Apparently it is the unknown and the possibility of discovering something new that leads us on through hours of toil that otherwise would be a hardship. We will be pleased to hear further from Mr. Toomer concerning the results of his experiments.

T. F. Cheaney of Ft. Lauderdale, Florida, is also interested in rotary wing aircraft. However, he has applied his talents to the creation of a design for a full scale helicopter, Fig. 2. You will note that his craft has a normal airplane body, a propeller rotating about a horizontal axis for thrust, forward or backward, normal horizontal stabilizer and elevators, fin and rudder. Lift is to be obtained by two rigid counter-rotating rotors; that is, the upper rotor turns in one direction about the vertical axis and the lower one in the opposite direction. This arrangement is provided to eliminate the torque effect. Obviously with only one rotor the rotor would turn one way and the fuselage would rotate the other because the rotor reacts back against the engine due to its drag. No such reaction takes place when the rotors turn in opposite directions. The drag of one then neutralizes the drag of the other. Theoretically this craft will work perfectly. Practically it will NOT.

A number of craft of this type have been built and tested. One notable experiment was the Bernelli helicopter with counter-rotating rigid rotors. The first tests were made in the hangar where the air was completely still. The craft rose without difficulty and hovered under perfect control. Its inventors were elated and prematurely assumed that they had solved the problem of helicopter flight. The craft then was tested in the open. All succeeding tests were unsuccessful resulting in bad crackups.

In each case the story was the same: the machine would start to rise, obtain a little altitude and then suddenly the rotors would fly to pieces and the plane crashed to the ground. Ten sets of rotors were constructed without any change in result. Fortunately on the last test its inventor was looking parallel with the plane of the rotors as the machine started to leave the ground. While watching closely he saw the discs formed by the rotating rotors come together on one side

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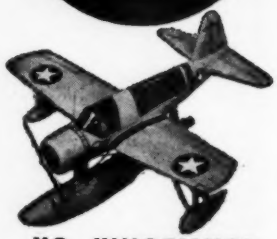

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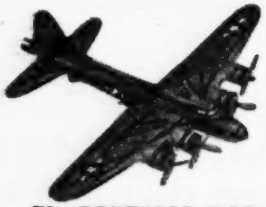

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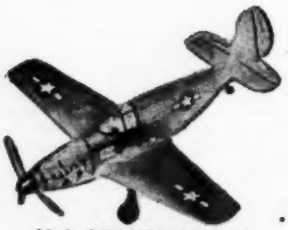

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and spread apart on the other. He shouted to the pilot who quickly brought his craft back to earth. This was the only set of rotors that were not broken. The crackups were due to flexing of the rotor blades under the influence of wind and side gusts. One side of the rotor would lift more than the other when the wind was blowing parallel with the plane of rotation. Such a wind would cause the advancing blade to lift more than the retreating blade and would flex the advancing side of the rotor up and the opposite side downward. Consequently, with one being flexed down and the other up the blades would crowd into one another and shatter. Other trouble was encountered in gyroscopic effect which made the craft difficult to maneuver under certain conditions, especially when there was wind.

Provided that this type of rotor could be made practical, Mr. Cheaney has applied an ingenious idea for directional control. Ailerons are incorporated at the trailing edge of each rotor. By pulling one set up to create drag, greater resistance is produced to the turning of one rotor than to the other. This results in a torque reaction to turn the body of the aircraft directionally about the vertical axis so that in this way the helicopter can be turned right or left. Pulling up the aileron of one rotor turns it one way, pulling up the aileron of the other rotor turns it the other.

No means for lateral control is indicated except the pendulum effect of the low c.g. below the center of lift of the rotors. Provided the lift of the rotors is centralized at the shaft because of the counter rotation and the use of this type of rotor is feasible, lateral control can be eliminated. It is obvious that if this type of rotor could be operated successfully designers would not use the very complicated mechanism now required, because the rigid type was one of the first used for experiments. It was discarded because it was not practical.

Not until blades of helicopters and autogyros were made so that they would flex up and down under the action of the airflow against them were these craft successfully flown. Cierva experimented for years before he achieved success by incorporating flexibly hinged rotors on his experimental craft. Helicopters were not flown successfully until they were equipped with flexibly hinged rotor blades.

So far we have only considered whether or not Mr. Cheaney's craft would rise. In order to rise the rotor blades would have to be set at a slightly positive angle. Mr. Cheaney achieves this positive angle by means of ailerons on each rotor. Pulling down the ailerons increases the angle of attack; raising them decreases it making it possible for the machine to descend, because when climbing the blades must be positive and when descending they must be negative and must spin freely about their axis disconnected from the engine.

A free wheeling device is incorporated in the motor drive shown in the plans. For climbing, the rotors with the ailerons pulled downward are driven by the motor. For descending, the rotors rotate freely with the ailerons turned upward.

Mr. Cheaney may really have something if he replaces his rigid rotors with a rotor of flexibly hinged blades.

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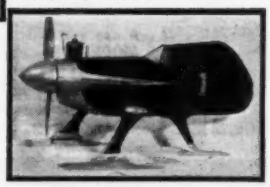

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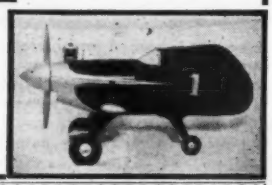

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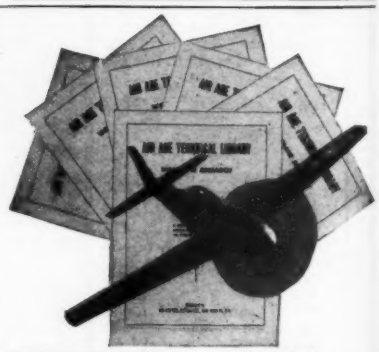

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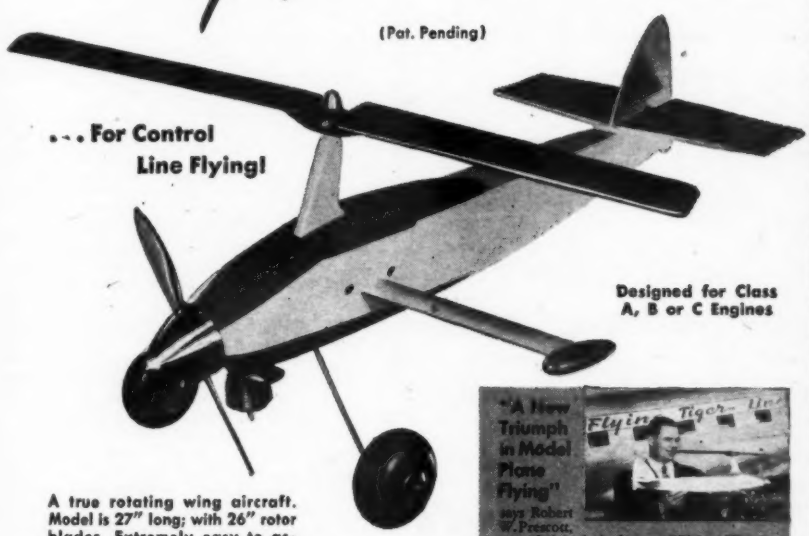

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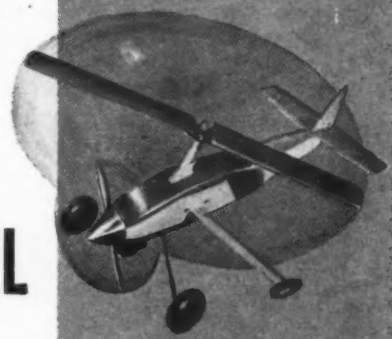

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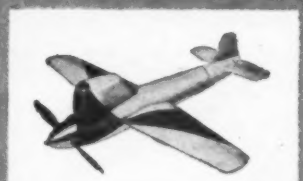

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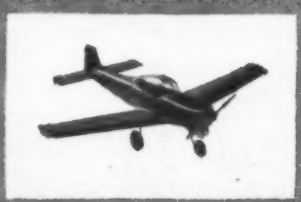

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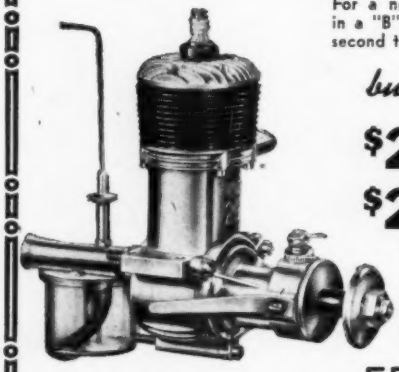

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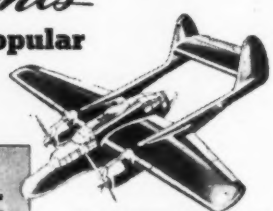

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Model Spad 13

(*Continued from page* 39)

airfoil given is for a flying model. The scale airfoil is given on the side view.

We are now ready to cover the parts. For lightness the author suggests that colored tissue be utilized. The model shown in the accompanying photos is covered with light green tissue. Cover all parts so the grain of the tissue is running the length of the part being covered. The wing tips require a separate piece of tissue on both top and bottom. The rest of each wing is covered with one piece on top and bottom respectively. The tail surfaces are covered with one piece to each side while the fuselage is best covered with one piece to each flat side and several small pieces on the curved top and bottom. When all parts are covered, spray lightly with water and take care that no warping results. One coat of clear dope is sufficient. The bond paper cockpit is covered with tissue also to blend the color scheme properly. After covering, carve and hollow the balsa headrest and cement in place.

Begin assembly by cementing the elevators in place. When this is done, add the rudder. Block up the fuselage and cement lower wings in place, taking care that no dihedral results. (The author found that by using fairly heavy hardwood wheels, the lack of dihedral was no serious obstacle to good flights.) Before adding the top wing, make two landing gear struts which are shown in detail near the front view. Cut a tiny bit of the cover away at the point where the struts attach and cement same in place; note that the landing gear struts splay outward only slightly. The two small notches on the struts are important for our shock-absorbing system. The crossbar is of 1/16" x 1/4" pine sanded to a streamline shape. The axle is .040" steel wire and is bound in place and cemented as shown on the front view. This type landing gear is capable of taking very rough landings; the ends of the axle move up and down in the small slots. Also add the celluloid windshield shown on the second plan sheet. The Aldis gunsight may be added for detail. A small piece of rounded balsa will do for this item. The machine guns are shown in detail, but only the portion above the dash line will be visible so only that part need be made. These are cemented in place according to the dash lines on the top view of the fuselage.

Now make the struts according to the details given beneath the front view. Omit the wires at this time; these are included for later reference. Cut away small bits of the covering and attach centersection struts. Cement these in place firmly, taking care that they extend exactly vertical from the top longeron. When these have dried in place, cement the top wing in place. Care in aligning the top wing correctly will pay dividends later. The interplane struts are now cemented in place after bits of tissue have been cut away from the wing covering. Note the small circles on the plans—these denote the points where struts attach to the heavy 1/16" sheet ribs. Do not omit the small crossbar from the inner set of struts. The small elevator struts are now cut, streamlined, and cemented in place. This small strut is also shown by dash lines on the side view.

Add the wheels of pine or other hardwood and bend the axle upward to hold wheels. Now we come to the final touch of detail, the exhaust stacks and pipes,

(*Turn to page* 68)

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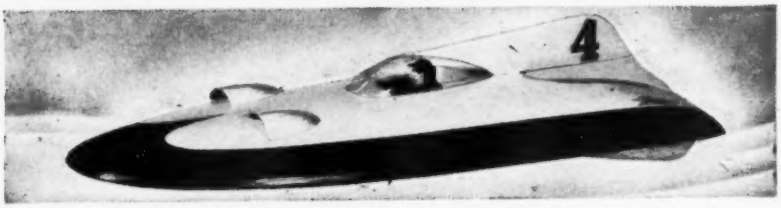

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and the small streamlined cylinder head housings. The exhaust units are made of bits of scrap wood according to the details shown just beneath the wing plans on the second plan sheet. Make two of these, dope them black and cement them in place with reference both to the side and front views. The streamline housings are carved from soft balsa and cemented in place just above the exhaust stacks. Add all wires which are represented with gray thread, preferably silk.

The struts can be cream color, or they may be clear doped to resemble the varnished struts of the old days. The tires, machine guns, the gunsight, and the tail skid are colored dull black; the cylinder head housings are green to match the fuselage; the wheel centers are aluminum or cream. Dope the headrest green also. The nose may be made green to match the fuselage or it may be cream to suit the individual fancy. Add decal insignia in the proper places. (The model illustrated carried the insignia of France, but First War U.S. markings or those of Belgium, Italy or Britain are equally proper.)

Carve the propeller from hard balsa to the dimensions indicated. The usual nose plug and a shaft of .050" steel wire are needed. Two loops of ⅛" flat rubber for a very light model will be sufficient; three loops will do for a heavier model.

Before flying, glide the model into tall grass. Nose heaviness or tail heaviness can be corrected with small weights. After perfect balance is obtained, try a hand-launched flight with about fifty turns on the rubber.

Patience and a well-lubricated motor will result in some good flights from this Spad even though it is small and has no dihedral.

Follow the plans with care and you'll have a fine little tarmac companion for those Nieuport 17-C.1 and Fokker E.III models which appeared several months ago to the same scale.

Good luck, happy Spad landings, and watch for more models of planes of the First World War.

Acknowledgements are due to Bruce Dietrich for his photography, and to Joe C. Hadsell for the construction of the model illustrated.

Simplex 25

(*Continued from page 20*)

not feel that the weight is too high, however, and the motor is certainly rugged and able to take punishment.

The rotary valve is simple to make, not at all fussy as to dimensions and very efficient; its use obviates the need for another port in the cylinder. By properly spacing the lower cylinder fin, the exhaust port is accurately located and is simply filed to shape.

The modern flat-top piston is made possible by employing twin bypass and exhaust ports. The piston and connecting rod assembly are practically foolproof in design; they are also very simple and easy to assemble, and the ball joint between them eliminates a lot of careful lining-up and fitting which would be required with the more conventional piston pin.

To further assist the less experienced builder, several of the trickier parts were purchased complete and ready for use. Thus, the timer and needle valve assemblies are standard replacement parts made for the *Forster 29* engine. Other commercial timers and needle valve parts,

(*Turn to page 71*)

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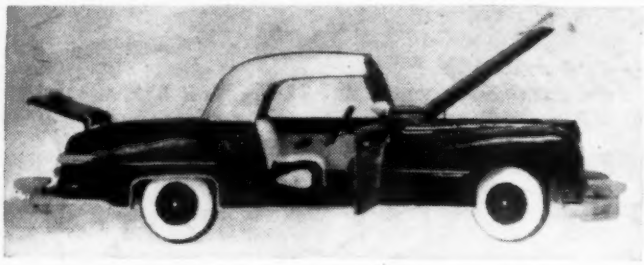

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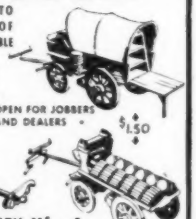

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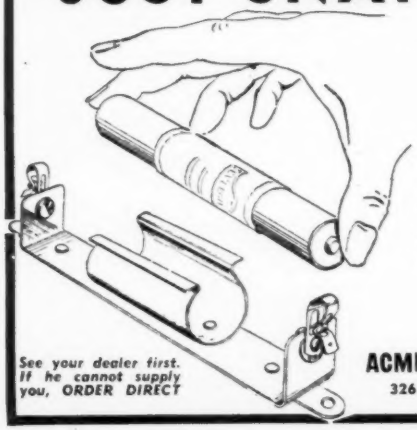

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such as those used on the *Ohlsson 23*, would also be satisfactory if the above are not available.

Finally, a few words on the accuracy of workmanship required. The fit between piston and cylinder is, of course, most vital. But if the cylinder is accidentally made a bit larger than called for in the plan, simply make the piston correspondingly larger to match. The same holds for most other fitted parts. However, certain vertical dimensions, alteration of which might affect the compression ratio—such as piston height, connecting rod length and the vertical fit between cylinder and crankcase—should be watched carefully.

To assist those who are not well versed in machine shop practice and who are unfamiliar with blueprint reading we have departed somewhat from the accepted manner of dimensioning, especially for parts that must be closely fitted together. Thus, decimal dimensions have been avoided whenever possible; on matching parts we follow the normally frowned-on practice of marking the two parts the same diameter, with a note on the drawing or in the text that one part must be made to fit another. This is of course poor production practice, but it is justified in this job where only a single unit is to be built.

As an aid in familiarization, all drilled holes are specified by drill number (or letter) and also by the actual decimal drill size.

CONSTRUCTION — The crankcase is started by cutting off a piece of 1-1/4" sq. aluminum 3" long. Mount in the four-jaw chuck so that one side is flush with the face of the chuck. Mark off the center 1-1/4" from one end and get this center running true. Bore a hole 1" in diameter and 23/32" deep to form the cavity in the front of the case where the crankshaft turns. The hole should be started with a small drill; then use larger drills until the diameter is large enough to work with a boring tool held in the tool post. Now with the piece still in the chuck, face off 1/8" about 1-3/4" diameter so that the depth of the cavity will be reduced to 19/32". Loosen two of the jaws slightly and remove the aluminum. Remount again with the finished side facing inward and bore the same size hole in the opposite side but this time only 7/16" deep. Face off 1/8" in the same manner as before until depth of the cavity is reduced to 5/16". According to the figures there should be a wall about 1/16" thick left between the two cavities.

Mount the square piece lengthwise in the four-jaw chuck with the shorter end, as measured from the cavity, clamped in the jaws about 1/4". Make sure the piece is running true by checking every corner, both at the chuck and outer end; otherwise the two main holes on the crankcase will not be at right angles to each other. Spot the end with a center drill and bring up the tail center for support. Now turn the portion nearest the tailstock down to about 1" in diameter and length so that 1/8" wall will be left between it and the crankcase cavity. The portion which is thus machined will be referred to hereafter as the "chucking stud." This stud does not appear on the drawings but may be seen in the photos. When the crankcase is completed the stud can be hacksawed off and the surface turned smooth.

Remove the case from the four-jaw chuck and replace the chuck with a universal or three-jaw chuck. Mount the work by the chucking stud and make

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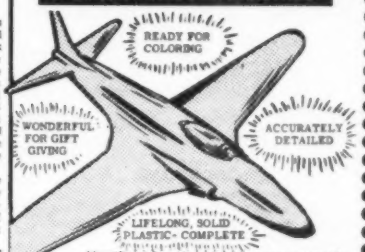

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sure it runs true. If not, use a wood or plastic mallet to tap the work where needed to line it up. Machine the outer end to 31/32" dia. by 5/8" long; this part will form the neck of the crank case with a wall of 1/8" between it and the crankcase cavity. Proceed by boring the hole 5/8" deep and .820" inside diameter.

Now for the threadcutting. Set up the gears (unless you have a quick change lathe) for 28 threads per inch, set the internal thread cutting tool carefully, and cut the thread slowly with the back gears in to reduce speed as much as possible; take light cuts until you reach a full thread which is a little more than 1/2" in length. This will leave about 1/8" between the end of the thread and blank inner wall so it is perfectly safe for even an inexperienced operator. Do not take heavier cuts than .002", and make this only about .0005" for finishing cuts. The depth of the full thread is about .020". It is best to use a small magnifying glass to check this; full thread has been reached when the tips of the threads just lose their flat appearance and come to a sharp edge.

The last operation on the crankcase is the milling of the oval-shaped slot in which the connecting rod moves. This slot starts at the inner wall of the front crankcase cavity and is a little more than 3/16" wide. Use a 3/16" endmill for cutting while the work is mounted horizontally in the milling attachment. Make sure the cut is in the middle of the crankcase so that the connecting rod will not bind. Also note that the front and rear cavities of the case must be independent of one another so that no leakage can occur between them, because the rear cavity will be used as part of the gas tank. (Note: If milling attachment is not available the slot can be made just as well by drilling and filing; no particular accuracy is needed because the slot must simply be large enough to allow clearance for the connecting rod.)

Now let's finish the other parts which are made of the square aluminum, namely: the front plate, which includes the main bearing, and the rear which is the gas tank.

For the front plate, cut off a piece of square aluminum about 1-3/4" long and center in the four-jaw chuck ready to machine the portion which fits into the crankcase. This fit should be good as it will help to reduce leakage and you may be able to do without a gasket at that point. The length of the full protrusion into the crankcase should be 9/32". This distance plus the 1/8" thick counterbalance of the crankshaft will place the connecting rod exactly in the middle of the crankcase so that it will clear the oval slot nicely.

With the front plate still in the chuck, drill a hole all the way through with an N (.302) drill, then cut to final size with a 5/16" reamer held in the tailstock chuck. The aluminum is used for a main bearing to obviate the necessity of fitting a bronze bearing. However, for those builders who have a small arbor press and are more experienced, a bronze sleeve can be pressed in and it will extend the life of the bearing. As shown, though, the 24ST aluminum makes a fairly good bearing, particularly if the reaming job is smooth and the fit of the shaft close.

Remove the work and the four-jaw chuck and mount the plate by the portion which has just been machined to 1" diameter in the three-jaw chuck. Cut down the outside as detailed on the drawing

which shows the square part to be 1/8" thick and the neck 7/16" dia. This latter measurement should be kept close as the *Forster* timer must fit snugly. Face off until the full bearing length is reached. For the present we will lay this part aside. Further work such as the screw holes and timer slot will be made later.

The gas tank requires a piece of square stock 1-3/4" long. Place in the four-jaw chuck a little less than 1/2" deep and get it running true. Then turn down to 1-1/16" dia. and 1-1/4" long. Now clamp this round portion in the three-jaw chuck and face off until the remaining square section is 1/4" wide. Follow this by turning the outer end to 1/8" wide by 1" dia.; be sure the latter is a snug fit in the rear of the crankcase. Bore out the tank to about 15/16" inside diameter and deep enough so that the entire gas tank wall will not be more than 1/16" thick.

Drill the hole shown for the fuel pipe with a No. 20 (.161) drill and free the small notch for an air vent.

At this point the holes for fastening together the crankcase, front plate and gas tank may be made. The simplest way is to clamp together two mating parts, such as the crankcase and tank, then bore through both pieces with the tap drill, which is No. 46 (.081). Separate the parts, tap the case holes 3-48, and open out the holes in the matching part to clearance size with a No. 38 (.101) drill.

It is possible to drill clearance holes all the way through the crankcase with the No. 38 drill so that the front plate, crankcase and gas tank could be held together with 3-48 screws of about 1-1/2" length, thus eliminating all tapping. However, the inexperienced builder may have serious trouble as the drill might deviate from a straight line and either break through to the inside of the case or the outer wall. Thus the fastening method shown is strongly advised.

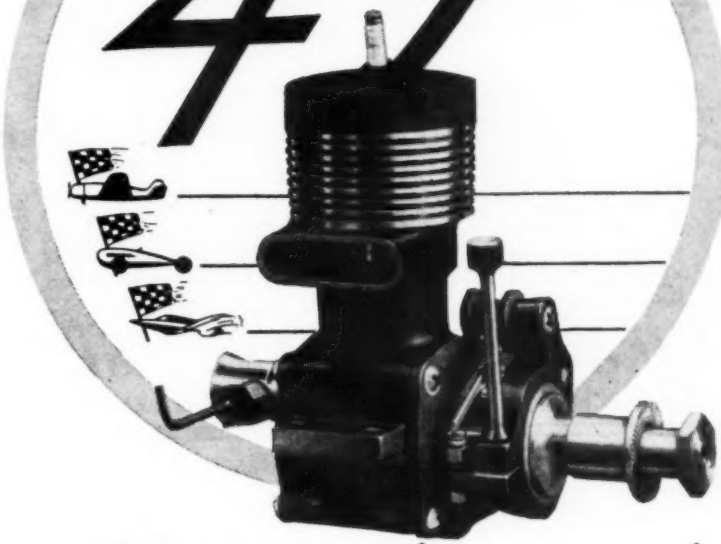
CRANKSHAFT—Mount the 1" cold-rolled steel in the three-jaw chuck and cut the outer end down to about .320" dia. and 1-5/8" long. As the bearing hole in the crankcase was reamed the crankshaft size should be the same as that of the reamer. However, reamed holes are often slightly tapered; the bearing hole was reamed from the rear (the hole would be largest at the rear), so check the bearing carefully before turning the shaft to finished size. The crankshaft does not have to be ground since a finish obtained with fine emery paper has proven very satisfactory in the engine pictured. Drill the hole in the front with a No. 23 (.154) drill and tap 10-32. If the crankshaft does not seem to go quite all the way in the bearing, round the edge of the bearing with a scraper as indicated on the drawing. Cut down the front to 1/4" dia. and 1/16" wide where the driving washer will fit. The flat for the washer can be filed on in any position.

Check carefully now to make sure that when the shaft is in the bearing and the driving washer tightly in place, the shaft has a slight fore and aft play of about .005". If this clearance is not allowed, binding will surely result.

Cut off the piece leaving 1/8" for the counterbalance and chuck the 5/16" shaft gently so as not to dent it or squeeze it out of shape. Better yet, make a split collar out of 1/2" diameter brass which is about 1" long and bored and reamed to 5/16" I.D. Saw this collar lengthwise, remove the burrs and slide the crank-

DURO-MATIC McCOY

"49"



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shaft in. The collar may be clamped tightly in the three-jaw chuck without the slightest chance of damage to the finished shaft surface. Face the counterbalance off smooth, then spot the center with a very sharp tool and move the compound out, reading off .344 (for a radius of 11/32") on the dial. At this point cut a groove a few thousandths of an inch deep in the counterbalance with the pointed tool. The diameter of the circle thus made will be the stroke (.688 or 11/16") of the engine. Drill the intake hole with a No. 1 (.288) drill 1-1/16" deep, then put the crankshaft aside to be finished later; the intake hole cannot be made yet.

At this point it is well to make the simple tool used for riveting a small socket into the piston later on. This tool is made from a piece of cold-rolled steel about 4" long and 5/8" diameter. Each end has a portion turned down to 39/64" diameter to fit inside the piston.

Bore out one end with an F (.275) drill and make the taper shown, either with a large center drill or, if this is not at hand, by setting the compound to make the angle across the taper about 60°.

The opposite end is cut down as shown and the end pointed to approximately the same angle as a standard twist drill, or about 120°.

This finishes the construction for this month. The next issue of M.A.N. will carry instructions for finishing and running the engine. In order that material for the complete job will be available when needed we list here the raw materials needed for the entire engine. The quantities given allow sufficient extra for chucking and cutting, but if the reader is a beginner at machine work it would be wise to double the quantities to allow for possible spoilage.

The cylinder and piston material is available from the Meehanite Research Institute of America Inc., Pershing Square Bldg., New Rochelle, N.Y. The aluminum can be had in any large city as it is a standard size and alloy. In the New York area, the Adam Metal Supply Co., 320 E. 25th St., New York City, can supply the required alloy.

List of Materials

12" 24ST aluminum alloy 1-1/4" sq. (crankcase, front plate, gas tank)
6" 24ST aluminum alloy 3/4" dia. (socket, carb. body, timer washer)
6" Meehanite type GA or GB 1-1/4" dia. (cylinder, piston)
6" cold-rolled steel 1" dia. (crankshaft, prop washers)
3" cold-rolled steel 3/8" sq. (form tool for conn. rod)
6" cold-rolled steel 5/8" dia. (conn. rod, forming and riveting tool)
2" drill rod 11/16" dia. (crank pin)

(TO BE CONCLUDED IN THE NEXT ISSUE)

World War I

(Continued from page 23)

America. With Curtiss, B. D. Thomas had assisted in designs of the Curtiss Model J from which the famous *Jenny* stemmed.

Late in 1916, after having designed models T-2, D-2, D-5 and SH-4 for Thomas under contracts for the U. S. Army, Navy and foreign governments, B. D. Thomas began work on model S-4, a single seat scout trainer. In general design, the S-4 followed European practice at the time and looked somewhat like a combination of Sopwith, Nieuport

(Continued on page 76)

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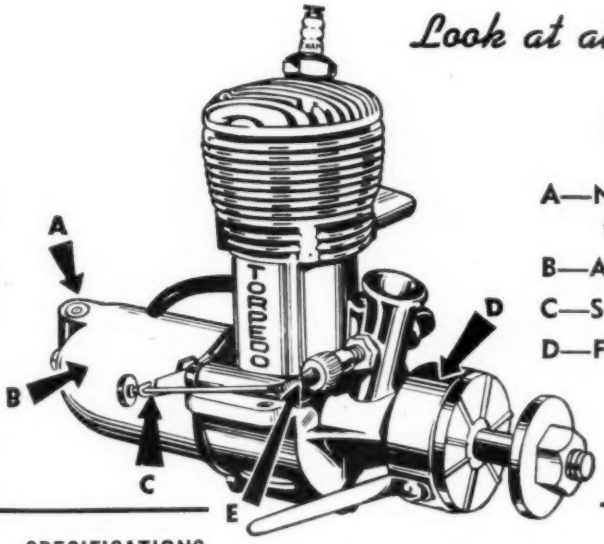

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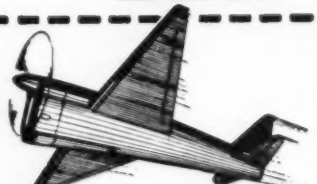

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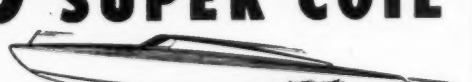

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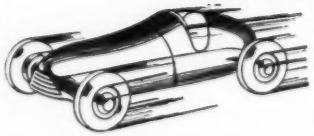

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and Bristol scout types. Performancewise the S-4 was on a par with its foreign contemporaries, but it was outclassed by newer overseas models. With a 100 hp *Gnome* engine, the S-4 showed a top speed of 90 mph and climbed to 7000 ft. in 10 minutes.

With an outstanding airplane on their hands, an outlook for firm orders from the U. S. government, but without facilities to build it, the Thomas brothers began to look for capital. They found backing from the Morse Chain Co. which had a large plant and facilities at Ithaca and the resultant merger became the Thomas-Morse Aircraft Corp.

The new company went ahead with the S-4, in which the expanding U. S. aviation branches were interested, and developed model S-4-B early in 1917. A better design for production, the new ship had a top speed of 95 mph and a climb of 7500 ft. in 10 min. with the same engine. In November 1917 the first of 100 S-4-B scouts was delivered to the Army. The S-4-B was highly successful but at the same time lacked certain features its constructors immediately set about to correct. A redesign in which the airplane was changed only superficially produced the most famous of them all—the S-4-C. Tests of the prototype during the winter of 1917-18 proved so successful that the Army immediately ordered 1050 of the type and production was begun concurrently with the last few of the S-4-B types. The first 50 Thomas-Morse S-4-C scouts were powered by the *Gnome Monosoupape B-9*, 100 hp rotary. Deliveries of this model began in May 1918, and the following months the first of the 1000 *Le Rhone C-9*, 80 hp equipped Tommys ordered by the Air Service was accepted. Of these, 447 were delivered up to the time of war contract cancellations following the Armistice.

It was principally the latter model that was declared surplus by the scores and purchased by sportsmen pilots and barnstormers during the early "twenties." The busy roar of its rotary engine that echoed from dozens of training fields all over the country during the war continued to be heard until about 1930. The moving picture industry used a great many Tommys after that in Hollywood air epics because the airplane was typically World War I in appearance. And even today, one would probably be able to find a surprising number of Thomas-Morse S-4-C scouts sentimentally stored away for safekeeping by flying oldtimers.

Wing Construction

A small compact biplane, the S-4-C had an upper wing span of 26 ft. 6 in., lower span 25 ft. 6 in. Respective wing chords were 5 ft. 6 in. and 4 ft. 3 in. The total area was 234 sq. ft., of which 25 sq. ft. were devoted to ailerons in the upper wing only. Gap at the fuselage was 4 ft. 6 in. and stagger 32 in. on the 100 hp models and 29 in. on the 80 hp type.

The upper wing was made in two pieces without dihedral but set at 1° positive incidence, washed in to 1-1/4° at the left tip. The two main spars were of spruce milled to an "I" beam except at points where the 7 compression members were attached. These members were merely airfoil-shaped solid spruce units secured to the spars by fittings to which internal wire bracing was also attached. Ribs were spruce plywood webbed with capstrips of milled spruce. Leading edge was plywood rolled around and tacked to formers in such a manner that rib nose capstrips were attached outside the leading edge.

(*Turn to page* 78)

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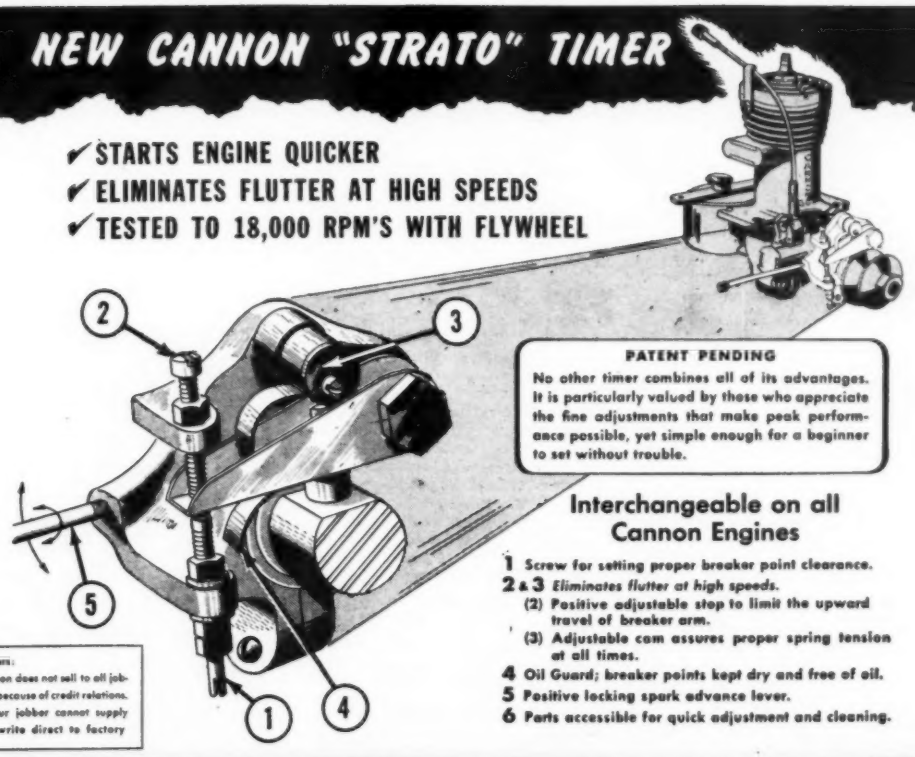

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Ailerons were each 7 ft. 1/4 in. in span with a chord of 21-3/8 in., hinged directly to the rear spar. Ribs were a continuation of a standard wing rib, attached to a wood spar and steel tube trailing edge. Ailerons were controlled by a torque tube running behind the rear wing spar and linked to the control stick by pushrods and cranks as in the Nieuport and Siemens Schuckert types.

The two lower wing panels were attached directly to fittings on the lower fuselage longerons and were identical in construction details to the upper wing. Each panel was set at 2-1/4° dihedral and 1/2° positive incidence. Trailing edge of the left-hand panel was depressed 1/4° near the tip to reduce propeller torque effects. Interplane structs were streamlined solid spruce with stamped steel fittings at their extremities for attachment to wing fittings. Centersection struts of solid spruce were attached to the upper longerons and were wire-braced in both their longitudinal and lateral planes. Interplane bracing consisted of double flying and landing wires, wood-strip filled to reduce resistance and vibration.

Empennage

Empennage of the Thomas-Morse S-4-C was typical of its period, incorporating non-balanced movable surfaces controlled by stranded cables. It was entirely fabric covered. The vertical fin was triangular in shape, bolted to a fuselage former and stern-post and braced with cables attached to the fuselage and stabilizer. Its framework was made of steel tubing and wood. The rounded rubber followed the same construction and was attached to the fin and stern-post by three steel strap type hinges.

In the first few production models of the S-4-C a symmetrical sectioned non-lifting stabilizer was used and was set at 0° incidence. To achieve better trim an engineering change dated May 31, 1918, incorporated a lifting stabilizer set at 1-1/2° positive incidence with which all subsequent Tommys were fitted. The stabilizer was braced by a strut on the underside. In both cases, stabilizer structure consisted of webbed plywood ribs with a steel tube outline. Elevators were tube outlined with spruce ribs milled to a tapering "I" section.

Fuselage Structure

The "ready to jump" appearance of the S-4-C was caused by its straight lower longerons and sweep down of the upper longerons from cockpit to tail. Fairing on the entire lower surface and aft of the cockpit on the upper surface of the basic fuselage frame was provided by light wood formers and stringers. The rotary engine was covered by an open faced cowl made of aluminum alloy and provided with an exhaust opening at the bottom. From the engine cowl to rear of the cockpit the upper deck was sheet aluminum covered and a small metal fairing on each side steamlined the engine cowl into the flat sided fuselage. Otherwise the fuselage was fabric covered. A 30-gal. fuel tank and a castor oil reservoir were located immediately behind the engine.

Huskily built to withstand rough treatment by novice pursuit pilots, the landing gear was made of right- and left-hand pairs of steel tube struts streamlined with wood fairings. A split type axle was located between two spreader tubes to which axle guide slots and stops were

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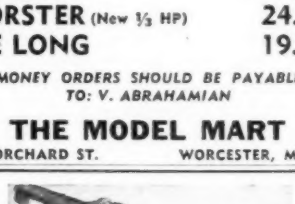

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welded. Shock was absorbed by coils of rubber cord. Diagonal bracing in the plane of the front struts and a vertical tension cable attached to the axle hinge strengthened the entire unit. The tail skid was made of wood with a steel spring leaf shoe, sprung internally on rubber shock cord.

Equipment and Performance

A standard Thomas-Morse S-4-C scout was powered either by a Gnome Monosoupape B-9 100 hp engine, with which it achieved a top speed at sea level of 104 mph, and climbed to 8500 ft. in 10 minutes, or with a Le Rhone C-9 rotary of 80 hp with which it had a 97 mph top speed and climbed to 7500 ft. in 10 min. Landing speed varied a mile or so above or below 45 mph, depending on the gross landing weight. While gross weights of variously equipped Tommys ran from 1330 to 1400 lbs., the empty weight of the basic 100 hp model was 965 lbs. and that of the 80 hp model 940 lbs.

Versatility was one of the S-4-C's greatest assets. It was outfitted to train pilots in every tactical pursuit operation. Some models carried radio equipment; others were outfitted as attack bombers; some carried cameras, smoke screen equipment, or were equipped with landing lights for night flying practice. The majority of Tommys, however, were either used for single seat formation and acrobatic training thus carrying no special equipment, or as gunnery trainers fitted with one synchronized Browning machine gun. Quite a few Tommys were shunted to Naval and Marine training units and participated in Naval air preparedness programs.

Tommy had a couple of idiosyncrasies, however, that were more or less common with all rotary engined airplanes. The first "don't" in the instruction book warned not to attempt a right-hand turn during the climb immediately after takeoff. At low speeds the Tommy's lateral control wasn't enough to overcome the engine's gyroscopic effect once a roll to the right was started. The second "don't" was the right-hand power-on spin at less than 4000 ft. In fact it was recommended to begin recovery from a right-hand spin at 4000 to give plenty of room for a pullout. Because the engine's gyroscopic force resisted, left-hand turns and spins were not as easy to accomplish, but recovery was immediate.

Maneuverability was one thing with which the S-4-C was generously endowed. It responded beautifully to all controls with but light stick forces. Elevator control stiffened a bit on pullout from a prolonged fast dive, but pressure could be relaxed once recovery was begun.

Landing an S-4-C on all three points without bouncing was difficult until the pilot got used to the airplane. The old rotaries were generally turned on and off on the approach to keep them warm but still running since there was no quick method by which to throttle them to idling speed. The consequent alternating torque and gyroscopic action before the pilot could use corrective measures frequently led to bumpy landings. But once on the ground the ship stuck fast and rolled briefly to a stop.

Although the Thomas-Morse S-4-C couldn't claim any victories over the enemy in combat, it fought the war in true Stateside manner and contributed tremendously to the moulding of a young air force. It was a tough little trainer, an airplane that will be remembered as a milestone in the parade of American airpower.

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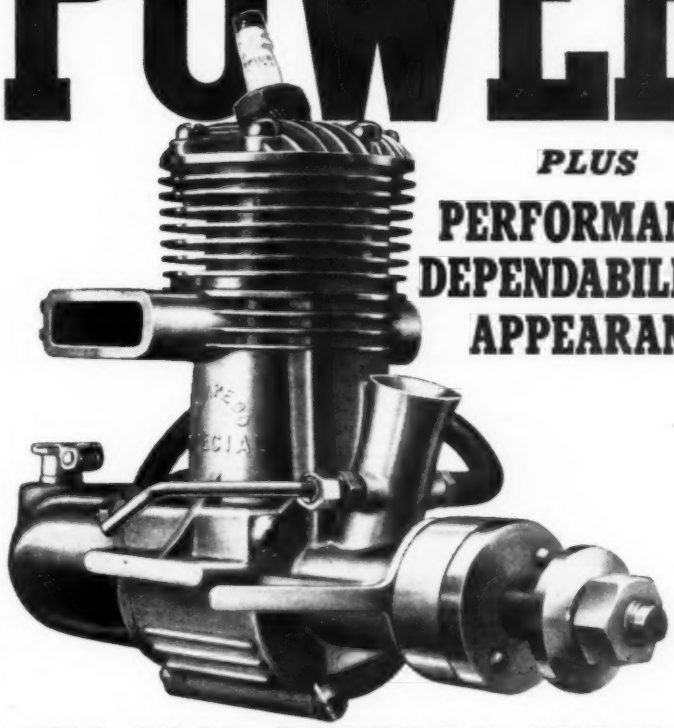
PERFORMANCE
DEPENDABILITY
APPEARANCE



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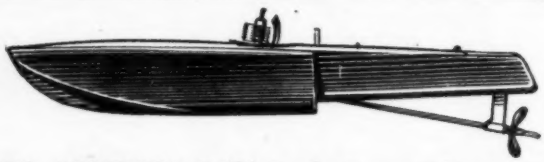

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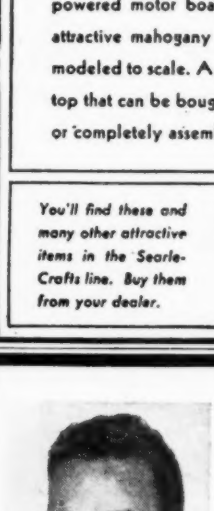

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Radio Control Notes

(*Continued from page 31*)

eliminates a lot of fiddling with a vibrator, dynamotor or auto battery.

My put-put, a 350 watt *Onan*, was purchased from army surplus stocks, and while heavier than many of this size has proven to deliver efficient service. When not being used for radio control these units are very handy for such situation-savers as heating electric soldering irons during a contest. At the Nationals in Wichita we used it to light our tent and burned many a gallon of midnight oil getting our ships ready for the following day's flying.

The entire radio system owes much of its extra details to the economy and quality of surplus electronic stocks, and builders contemplating an R-C job would do well to investigate this source of supply. For example, the transmitting antennas are half-wave doublets fed by coaxial cables. Ordinarily this cable and the silver plated *Amphenol* connectors and plugs used with it would run into quite a sum of money. At surplus prices they were just as economical as less efficient equipment.

With recent Congressional urging, the enormous surplus electronic stocks have begun to reach the market in greater quantity. Especially attractive are some of the types of equipment now being offered. My eye has been particularly taken by the appearance on the market of brand-new SCR-522 sets on sale at around $60.00. Familiar to all G.I.'s as the VHF set carried by just about every Allied aircraft, these beautiful transmitters and receivers cost the government about $2,500. Four crystal-controlled frequencies in the 100-156 mc. range are available at the flick of a switch. Needless to say, such an arrangement is tailor-made for R-C work.

The receivers carried by the *Electra* are conventional super-regeneratives using the Raytheon RK-61, hearing aid size of the popular prewar RK-62 radio control tube. (See articles by E. J. Lorenz in September and October 1946 M.A.N.) They are built around a standard RCH 11-A relay. Weighing only 3.5 oz. each, they are mounted on an aluminum chassis slung in a balsa frame with rubber-bands to absorb vibration.

One of the receivers is attached to a RCH 134 reversible geared electric motor equipped with limit switches and used to control the engine carburetor. When a signal is sent the motor pulls the throttle arm back to the idling position and holds it there as long as the transmitter is on. Turning off the signal reverses the motor and the throttle arm returns to high speed position. A toggle switch on the control box serves to operate the throttle control transmitter.

The rudder and elevator are operated by RCH self-neutralizing escapements which are attached to the other two receivers. These escapements are rubber powered and are mounted in the fuselage near the rear of the opening made by the removal of the cabin. The rubber motor runs back to the tail where it can be conveniently wound through the end of the fuselage. Nylon fish line is used for control cables. This is tough and strong and lessens friction at points where the cables pass through eyelets. At first radio dial springs were installed in the cables to maintain tension, but it was found that they tended to bind against each other and make control operation difficult. No trouble has been encountered with slack-

ening of the nylon cables and the springs were found to be unnecessary.

Nose wheel steering is accomplished without addition of another control channel by hooking the steering motor to the rudder receiver relay. A switch with a wiper arm that completes contact when the plane is on the ground turns off the steering motor when in the air. It makes little difference whether the rudder tracks with the wheel because it has little effect while taxiing and returns to neutral whenever the nose wheel is neutralized.

These self-neutralizing escapements used on the rudder and elevator give one control upon receipt of a signal and return to neutral automatically when the signal is turned off. The opposite control is obtained by sending a short signal followed by a continuous pulse, neutral automatically being obtained when the transmitter is no longer keyed. In the control box these signals are keyed by a rotary tap switch. Turning the switch to one control turns the transmitter on and off when returning to neutral. The other control has an intermittent on point followed by a continuous on as the switch reaches the end of the movement. Such an arrangement is simple and does not involve the use of complicated sequence mechanisms. Best of all, transmitter failure does not leave you holding the bag in the middle of a power dive, since all controls return to neutral upon interruption of the signals.

The receivers use Eveready Mini-Max 455 Batteries (weight 7 oz.) for the B supply and medium flashlight cells for the filaments. The little plastic-case wet cells used for U-control and race cars were found to be especially suited to the requirements of the escapements and the motors. They allow heavy current drains without much voltage drop when several of the controls are being operated consecutively and in being easily rechargeable represent a saving in battery costs.

Ball bearing washers are used on the control surfaces for frictionless operation, and the elevator was counterbalanced to lighten the load on the escapement.

Although many esoteric and algebraic formulas have previously been proposed for computing the area necessary for control surfaces, I would hesitate to recommend any definite percentage. The amount required depends mainly on the design and flying trim of the particular ship and is best determined by experimentation. For this reason the control surfaces of the *Electra* were made from solid balsa to facilitate changing the area in accordance with the outcome of tests. The rudder area proved to be just about correct. The elevator shown is sufficient for the amount of control necessary for takeoff and landing maneuvers but is too small for more violent acrobatics such as loops. As a general rule to follow, a slightly small area with a large arc of movement is less sensitive to adjustment than vice versa.

The pasture from which our club generally flies is not very smooth and, faced with the prospect of decapitation by the prop if we tried handlaunching, it was decided that a smooth takeoff surface was essential for test flights. Accordingly we obtained permission to fly from some of the acres of concrete in the possession of the local naval air station. The first flights were notable for the high speed attained —on the ground. The ship scooted about with modelers in hot pursuit, but refused to get off. Blaming at first the landing gear (it taxied in wide circles) we spent the rest of our allotted time getting it to track properly.

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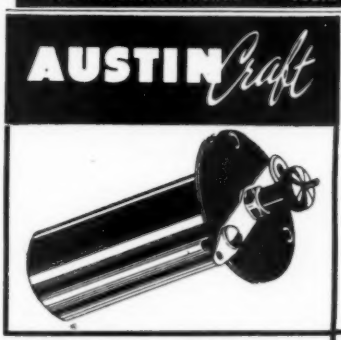

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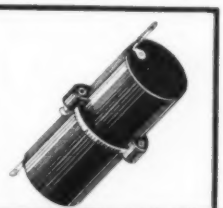

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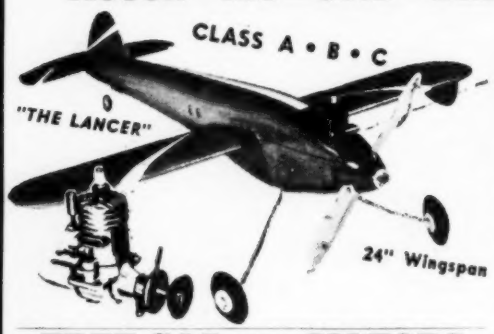

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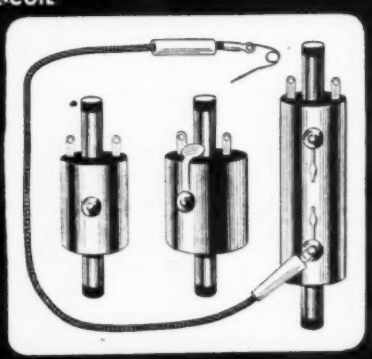

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Appalled by the reams of red tape with which the Navy still joyfully occupied itself, we retired to an auxiliary landing field, that we had discovered was not being used and, free from brasshats, continued the tests. Some time was spent and quite a few miles were put on the plane before we eventually puzzled out that the ship was definitely nosing down and this was traced to the stabilizer. Designed along free flight lines, the ample lifting tail had sufficient leverage to overcome not only the 60% of chord balance point, but also further movement of the C.G. rearward. It was finally necessary to increase incidence and add upthrust to get the ship into flying trim. This experience suggests that it might be advisable to use a non-lifting symmetrical section stab on large size controlled ships.

No further trouble was encountered, and before winter weather discouraged further trials we were pretty well acquainted with the *Electra's* flying characteristics. Acrobatics, loops, etc., have not yet been attempted because the up and down controlling made it evident that the elevators were too small for these maneuvers. The three channel simultaneous operation certainly proves worthwhile in precision flying. In spot landings you can use combinations of the controls to really set it down on a dime and get a nickel change.

The RK-61's have been operated from distances of a mile without a miss, sometimes with obstructions in the way. Further control is certainly possible but it's no fun flying out into the next county even if your transmitter is powerful enough. Occasionally when you don't click the pulses just right the self-neutralizing escapements will miss a beat and give you the single pulse side of the control instead of the double pulse and the operator must be alert to this possibility. A quick flip of the switch back to neutral will remedy this situation. One thing can be said for this type escapement—loss of control never causes a crash and when the put-put ceases to put, the worst you can have is a cross country chase after a controlled ship that has suddenly become a free-flight.

At the present time experimentation is proceeding on an audio tone control system. This method, in which the receiver differentiates between audio tones by means of filters, is the basic method used by the armed forces in their radio-controlled target craft and other remotely guided planes. In my opinion this will eventually prove to be the only worthwhile system of control for a really responsive plane. Sooner or later the number of ships flying at the Nationals and other large contests will definitely obsolete the present practice of spreading the control channels for one plane from one side to the other of an amateur band and flying one at a time. The advantage offered by audio control is that only one transmitting frequency is required and a large number of controls may be operated over it. Even if not-notably-selective super regenerative type receivers are used in the planes it will be possible for 4 or 5 to operate at once, more if audio channels are regulated, on a single band. If such intriguing possibilities as races and dog fights are ever to become a reality then something along the lines of audio control must be developed.

Radio control still remains a field in which a lot of pioneering may be done. The war set back experimentation considerably and the turnout in the R-C contest at the Nats was disappointing. But

a successful radio control job is something that cannot be whipped up in a month or two, and the number of builders I ran across who were contemplating R-C is indicative of what is coming in the sport.

Certain it is that one of the greatest stumbling blocks for many would-be radio controllers is the necessity of possessing an amateur radio operator's license. The hobbyist is rare who can devote maximum enthusiasm to an absorbing interest and still find the time and energy required in beating 13 w.p.m. of Morse code into his head. The most complex problems of electrical theory can be mastered with study, but to some unfortunates radio code is a devious gibberish that absolutely defies them regardless of the effort applied.

The AMA's radio control committee, headed by Walt Good, tackled this problem but was unable to get any satisfaction from the Federal Communications Commission. The only group who might be able to secure such a concession is the ham radio American Radio Relay League. They recently withdrew their request that had been placed with the F.C.C. for issuance of Class D licenses, requiring no code and limiting operation to the very high frequencies. This action very probably stemmed from the understandable reaction of the some 60,000 U. S. hams to this letting-down-the-bars proposal; their bands already being veritable bedlams. Solution to this objection could be found, however, in restricting Class D licenses to a band of their own. Until the A.R.R.L. is solidly behind such a proposition, though, it has little chance of fruition.

There is some possibility that the proposed Citizens Radio Band of 460 to 470 mc. may be the answer to the modeler's prayer. License requirements on this band would be very simple and further information should be available from the F.C.C. soon. The opening of such a service would be a greatly beneficial stimulus to "R-C"—a fascinating angle to a fascinating hobby.

Plane on the Cover

(*Continued from page 25*)

Second clue is the fact that the wind tunnel cannot help at the speed of sound. The reason for this is quite simple: in the conventional subsonic wind tunnel with which we are all familiar the area is contracted down to a throat to force the air to speed up in accordance with Bernoulli's law. Subsonic wind tunnels, then, are hour glass shaped with the model mounted in the "throat," or smallest section of the tunnel where the airflow is fastest. In the supersonic tunnel however the situation is just the reverse; the area is expanded to force the airflow to speed up. Supersonic tunnels, then, although also hourglass shaped, have the test section in the large part of the tunnel where the airflow is the fastest.

With the subsonic tunnel dependable test results are available up to Mach number .95 approximately, or 95% of the speed of sound. With the supersonic tunnel, dependable test results are available down to Mach number 1.15, or 115% of the speed of sound. Theoretically, then, a sonic wind tunnel would be a straight tube, neither converging (as in the subsonic) or diverging (as in the supersonic). Obviously however a straight tube would accomplish nothing. As a result, there can be no sonic wind tunnel and therefore no wind tunnel test results on sonic speed.

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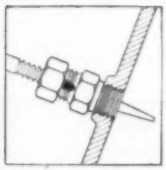

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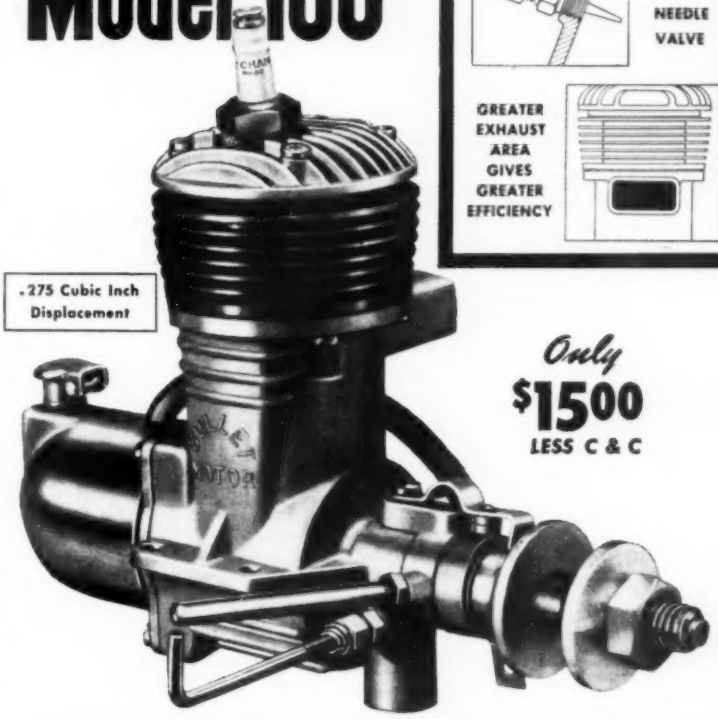

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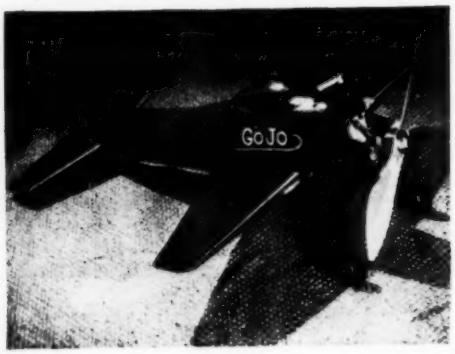

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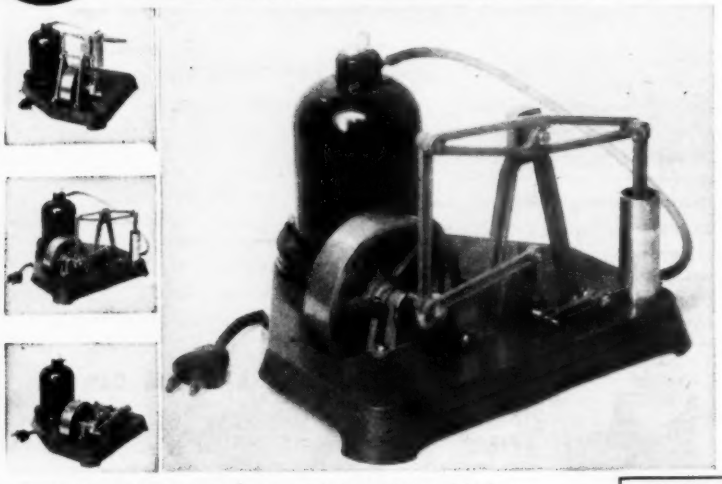

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But scientists are resourceful and they have attacked this problem in several interesting ways. For example, it has been known for many years that the airflow over the thickest part of a wing is considerably higher than the speed of the wing itself through the air. On a fairly thick section the air may flow as much as 30% faster over the top of the curve than the speed of the airplane. As airplane speeds climbed past 450 and up towards 500 mph, the air passing over the wing frequently reached sonic speed. By mounting a tiny airfoil parallel with the wing chord and connecting instruments to it, lift, drag and moment data could be obtained at sonic speed. This has been used extensively both here and abroad to provide sonic airfoil data.

Another method was to drop heavily weighted streamlined missiles from high altitudes. During their ensuing free fall to the ground the combination of great weight and streamlining enabled them to attain sonic and supersonic speeds. Through the use of telemetering equipment mounted inside these missiles, radar equipment and photographic equipment located on the ground, data is obtained on the drag of these missiles as they fall through the air.

Still another method is used: rocket-propelled missiles mounting tiny airfoils connected to telemetering equipment inside the missile. Standard Army and Navy rockets fired from launching stands are used and as many as four, six or eight airfoils can be mounted on the missile relaying lift, drag and moment data to the ground during a single flight.

As productive as these systems have proved, however, one important type of data was lacking: stability and control and only one method of obtaining this data at sonic speed promised accuracy and adequacy: a sonic airplane.

The National Advisory Committee for Aeronautics prepared specifications for such a sonic test airplane and conferred with Army Air Forces on the possibility of its construction. The AAF, as a procuring agency, readily agreed and the project was established in the spring of 1945. The NACA furnished outline drawings, wind tunnel test data and specifications to AAF, which awarded a contract to Bell Aircraft Corp. for constructing three of the special planes.

The first requirement for sonic speed was tremendous power and only the rocket motor promised power adequate for the purpose. As a rocket-propelled aircraft, the Bell XS-1 is certainly not the first and it is doubtful if it could have been built even a few months before it was. For this feature we have the Germans to thank for their experience dates back to September 30, 1929, when Max Valier made a successful flight in a rocket-powered Opel sailplane, the first rocket-powered aircraft flight in history.

This craft was the work of the German Rocket Society which was absorbed into the German Army when Hitler came to power, and it was set up in lavish fashion at Peenemunde, famed V-2 experimental site. Research work on rockets was accelerated and resulted in the deadly V-2, one of the truly outstanding technical achievements of this century. The first rocket-propelled combat plane was a joint effort of Prof. Alexander Lippisch and his flying wing experiments, and Helmuth Walter and his rocket engine work. The two were combined in the DFS-194, which made its first flight in 1940, long before America entered the war. Lippisch joined the Messerschmitt company and his design was produced as

the Me-163 *Schwalbe* ("Swallow"). Delays in production and service testing prevented the Me-163 from reaching the front until 1944, but it was fully operational early in 1945 and a constant menace to Allied bombers over the continent.

Oddly enough the rocket motor used in the Bell XS-1 has a strangely similar history, although considerably more belated. It is an outgrowth of the American Rocket Society, the leading members of which formed Reaction Motors Inc. in 1941. Their research work was continued under Navy contract from early 1942 until the present time. This work resulted in a multiple-cylinder rocket motor developing 12,000 hp at the speed of sound. Each of the four cylinders have an output of 1500 lbs. thrust and are individually controlled so that the power of the XS-1 may be varied from about 1500 hp (at 375 mph) to 12,000 hp (at Mach No. 1).

The Bell XS-1 design incorporates several basic features to the exclusion of many others found in combat aircraft. Fundamentally, it was laid out as the smallest, strongest and most streamlined aircraft possible to build at the present state of the art. It is only 31 ft. long and has a wingspan of only 28 ft. It was designed to a load factor of 18, the greatest by far ever built into any airplane. This simply means that it is able to "take" a load up to 18 times as much as its own weight. Certainly the XS-1 is unlikely to come apart in the air under the pounding it is expected to take.

The wings of the XS-1 are built of solid aluminum alloy machined out of bar stock. The skin is ½ in. thick at the root and tapers to about ⅛ in. at the tip. The fuselage is of conventional aluminum alloy construction with the cockpit located in a flush canopy that does not interrupt the smooth lines of the nose.

The powerplant is one of its most unusual features. Fuel for the rocket motor is a combination of liquid oxygen and alcohol with the total fuel load being 8177 lbs., half again the empty weight of the airplane. However, changes have been made in the original fuel system which reduce this capacity. The original design of the airplane specified a system in which the liquid oxygen and alcohol would be supplied to the rocket chamber by a turbine pump. Design problems of this system however delayed its installation, and the alternative was a pressurized fuel tank system. This method, now in use, comprises two tanks held under pressure by gaseous nitrogen. As the fuel cocks are opened this pressure forces the fuel from the tanks and into the combustion chambers of the rocket motors. However, the additional weight of these pressurized fuel tanks reduces the fuel capacity to only about 5,000 lbs. For this reason the rate-of-climb is reduced from an estimated 45,000 ft./min. with the turbo pump system to only 28,000 ft./min. with the pressure system! (This is to be compared with the recent rate-of-climb record of 10,000 ft. in 100 seconds set by a Grumman F8F-1 *Bearcat* at the National Aircraft Show in Cleveland!). A more serious drawback of the present fuel system however is that it has reduced the endurance of the XS-1 from the planned 4.2 minutes down to only 2.5 minutes.

The XS-1 has actually been flying for nearly a year. Because of its high wing loading (more than 100 lbs./sq. ft.) and high sinking speed, early test flights were carried out as a glider in an empty weight condition. The tiny plane made dozens of such flights with increased weights to enable the pilot, the late Jack Woolams, to gradually "feel" the plane out. The

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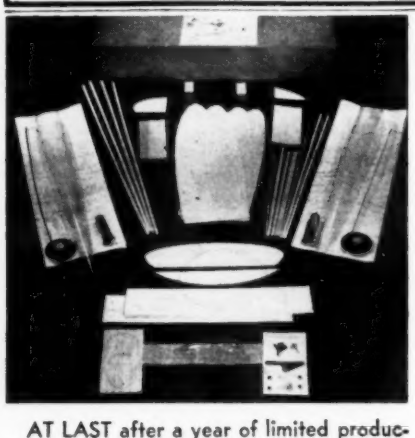

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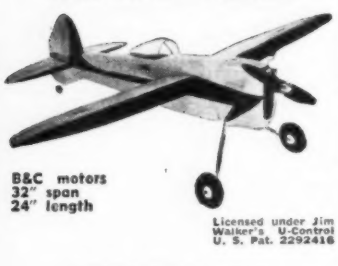

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rocket motor was installed last fall and the plane carried to Muroc Army Air Base, Calif., where additional glide tests were made with the added weight of the engine and fuel. These flights were made by Chalmers H. "Slick" Goodlin who took over the assignment following Woolams' death in his special National Air Races speedster.

The XS-1 is mounted in the belly of a specially modified B-29 *Superfortress* and flown aloft to altitudes as high as 40,000 ft. At a signal the tiny craft drops out of the *Superfort's* belly and, when well clear, starts its rocket motors and zooms into the sky. Because the speed of sound is lower at high altitudes, because the air is thinner and because the rocket motors develop a constant thrust independent of altitude, the XS-1 will make its greatest speed at high altitudes in the 60-80,000 ft. region.

The first successful flight of the XS-1 (and the first rocket-propelled aircraft flight in the United States) was made last December during which the plane performed satisfactorily. On this first flight, Goodlin cut loose from the B-29 at 25,000 ft. and cut in the first of his motors. Shortly afterward he cut in a second, a third and then a fourth but held this maximum power for only a few seconds. His speed was about 550 mph. However, only 600 gals. of fuel was aboard which prevented extension of the 19 min. flight (from "mother" plane to ground).

These early flights are actually "acceptance tests" performed by Bell Aircraft in front of AAF witnesses to ascertain that the plane meets its contract specifications. These require a demonstration of adequate control at Mach number .8, an 8G pullout and takeoff and climb from the ground under its own power. After satisfying these requirements the plane will be accepted by the AAF which will, in turn, transfer it to NACA for the research program planned.

The XS-1 is complete with 526 lbs. of test equipment designed and installed by NACA technicians at Muroc. Such data as airspeed, acceleration and control positions are telemetered to the ground to provide a record in the event the aircraft is destroyed. More extensive data on control forces, air pressures over the wing and tail, control and plane accelerations and structural strains are recorded within the airplane on special recording instruments.

It is this instrumentation that comprises the heart of, and the reason for, the XS-1. It is not a new supersonic fighter plane, or a racing plane intended to capture the world's speed record. It is a research tool, just as the wind tunnel, the free-fall missiles, the tiny airfoils on fighter wings and the rockets used for sonic aerodynamic research. It is hoped by those who designed it, those who planned the research program and those who will fly it that the Bell XS-1 will fill in that dark void which scientists throughout the world have been unable to bridge.

PHOTO CREDITS

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Engine Laboratory

(*Continued from page* 41)

trarily, numbers inversely corresponding to the turns of wire being satisfactory.

The electrical equipment described in the last two paragraphs is wired together with No. 14 copper wire and soldered connections as shown in drawing 6. A voltammeter (VA) of the pocket battery tester type is used to measure current flow. It is mounted on a VA bracket made of brass and connected by a screw (—) to the engine block. The VA has terminals V+ and A+ which engage screws V+ and A+ screwed into an upper corner of the engine block at an angle of 45°. Certain wire connections are made to the three screws as shown in drawing 6. The screw (—) can be loosened and the VA readily removed for carrying in your tool box or pocket when on the flying field or when buying batteries. Some reader may suggest that the control panel would be a better place for the VA. That would be desirable for many reasons but not from the standpoint of securing accurate reading. The VA must be at least 4" away from the spark coil or the magnetic field of the coil will affect its reading.

The battery switch connects the No. 6 dry cell with the ignition circuit when B— and B— are both adjusted to 3. Both flashlight cells (F) are the source of current supply when B+ and B— are on 2, and either the left hand or the right hand flashlight cell can be used alone by having B+ on 2 and B— on 1 or B+ on 1 and B— on 2 respectively. The battery switching and rheostat arrangements disclosed permit the most economical utilization of the battery current and especially flashlight cells as the stronger one of the two can be most used. In drawings 1 and 6, wires G, SP and T connect to the engine (ground), sparkplug and timer, wire SP being of course a high tension lead.

Engine Starting and Running Tests

Start tests by turning the rheostat all the way up, and try starting a cold engine on the cell DC. If it starts all right, turn the rheostat back till the engine starts to miss; then turn it up a notch or two to prevent missing. After the engine is well warmed up, see if the rheostat can be turned down any farther and still keep the engine running. Then press the ES button, and after the engine stops determine the amps and volts by first pressing the AC button and then the VC button. During the amp test the timer points must be open; during the voltage test they must be closed. This is indicated by the signal light (SL). Now multiply amps by volts and the result is the minimum wattage required for operating the engine.

Next try starting the engine after it is cold with the rheostat set back from maximum about 5 notches. Repeat several times till you find the minimum setting that will start a cold engine. The amperage and voltage can then be checked and the wattage calculated. Thereafter, when starting, the rheostat can be set to secure this wattage as sufficient instead of starting with full capacity of the current source when it isn't necessary. You will find that in addition to longer battery life you will also get longer timer and sparkplug point life when using minimum starting and running currents.

Make a record of your readings. As the cells run down a higher setting of R will be necessary to secure the desired amp and volt readings. For this reason

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3/32 x 3/32	6c	3/8 x 3/8	9c
3/32 x 3/16	5c	3/8 x 1/2	10c
3/32 x 1/4	3c	3/8 x 3/4	12c
3/32 x 3/8	2c	1/2 x 1/2	10c
3/32x1/2	2 1/2c	1/2 x 3/4	12c
1/8 x 1/8	6c	1/2 x 1	16c
1/8 x 3/16	1c	5/8 x 5/8	15c
1/8 x 1/4	3c	5/8 x 1	18c
1/8 x 3/8	3c		
1/8 x 1/2	2 1/2c		
1/8 x 3/4	3 1/2c		
1/8 x 1	6c		
3/16x3/16	2c		
3/16 x 1/4	2c		
3/16 x 3/8	2 1/2c		
3/16 x 1/2	3c		
3/16 x 3/4	5c		
3/16 x 1	7c		
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3/32 x 2	9c
1/8 x 2	11c
3/16 x 2	13c

1/4 x 2	16c
3/8 x 2	17c
1/32 x 3	10c
1/16 x 3	11c
3/32 x 3	13c
1/8 x 3	15c
3/16 x 3	17c
1/4 x 3	19c
3/8 x 3	25c

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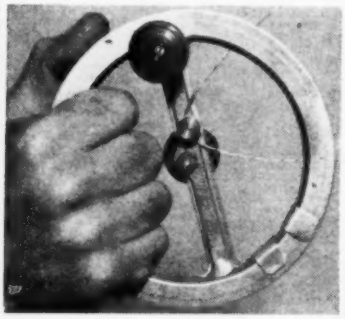

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the same rheostat setting does not always give the same results, and occasional checks on the available current should be made. When a different dry cell or combination of cells is used, the rheostat may have to be reset to get the same wattage output. When a full "ON" position must be used, it indicates that the cell, or pair of cells as the case may be, is about ready for discard for starting purposes but may still be usable for running.

The voltage and amperage of any of the three cells can be checked at any time by depressing the VB and AB buttons successively while the light SL is out. The battery switch of course is manipulated to connect the cell on which a test is desired to the B+ and B— terminals. Never use the ammeter longer than necessary to get a quick reading as it is a considerable drain on the cell.

Your recordings for different engines can be kept for future reference, and when later operating the same engine you may find that more wattage is required for starting or running. Progressive rundown of the engine, sparkplug, etc., can thus be determined. Recordings can also be made for various dry cell combinations such as a single flashlight cell for both starting and running, etc.

A great deal of valuable reference information can be obtained from the tests described and undoubtedly you will discover others. During tests do not depress more than one pushbutton at a time as readings are then inaccurate. Always be sure to read the proper scale on the volt-ammeter or you will have errors in your recordings. Any tests when the engine is running are of no value as the current is on only intermittently and about 20% of the time. The A and V readings are thereby considerably reduced and also inaccurate due to vibration.

Finally, a word about construction of the battery switch. The contacts should be spaced far enough apart so that the switch blades never touch two contacts at once. Otherwise the blade may be left in a shorted position and thus run down one of the cells. When switching from one cell to another, the switch must be moved quickly to prevent the engine from stopping.

Flash

(*Continued from page* 6)

missile is up to speed, this booster assembly drops away and the missile continues its flight on the power of an internal rocket developing 200 lbs. of thrust. The *Tiamat* is used for research purposes by the NACA to develop fundamental data for design of combat missiles.

DOUGLAS AIRCRAFT is pressing development of its miniature *Mixmaster*, a smaller version of the DC-8 designed for five passengers. It is powered by two Continental engines driving propellers at the tail. The 500 hp engines give the light transport a speed of about 250 mph. The design is being groomed for the "executive" class suitable for use by oil companies and other firms with large numbers of scattered dealers.

THE NAVY announced development of a .70 caliber machine gun which, it claims, is one of the most destructive weapons ever developed. It can be equipped with a radar fire-control system by which it picks up enemy aircraft or missiles, tracks the target and opens fire at the critical instant. It offers numerous advantages over the .60 caliber aircraft machine gun which has undergone extensive development by AAF.

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Air Ways

(*Continued from page 37*)

kits in the five to ten dollar class, we are glad he was able to surmount the difficulties and disappointment caused when he found the supposedly high class kits to contain ". . . parts which, when you try to assemble, do not fit, are lopsided, out of line, etc. Balsa furnished in many cases is the lowest grade soft balsa obtainable. Instructions are incomplete and the full size drawings are off scale. To the beginner these things are a pain in the neck and no doubt frequently kill interest in the hobby."

With the last sentence we heartily agree and hope that the offending manufacturers will take note and remedy the condition before less persevering beginners than Major Morris drop the hobby completely.

• •

Picture No. 1 shows G. B. Dun, 113 Holly Rd., Northampton, England, holding a tailless glider named *Scylla* which was designed by A. G. Cockle. As may be seen from the photograph this glider has a superb finish and is moreover a very fine flyer. It is of all-balsa construction, utilizing a 1/16" sheet leading edge covering and the airfoil is an original developed from the Davis style section. The ship is completely covered with Jap tissue and is finished in silver with black lettering and two red panels on each wing. Mr. Dun recently flew this glider in a continental model meet and placed sixth in the glider section.

No. 2 pictures a control line gassie, the property and "problem child" of Capt. Robert M. Dial, AAF Advisory Team, MAG, 2nd Air Transport Group, CAF, APO 933, San Francisco, Calif. Capt. Dial, a modeler of 14 years experience, tried 15 times to R.O.G. his model and broke the same number of props in the process. The next step was installation of a tricycle landing gear (not shown in photo), and two additional test flights failed to show any change of temperament on the controliner's part. The ship left the ground in good order but immediately entered a series of gyrations that ended in a crash before one circle had been completed. Originally powered with a *Brown*, Capt. Dial's model now houses an *Ohlsson 60;* it was constructed with a frame of plywood from Jap aircraft and covered with thin plywood.

The joint efforts of Sam H. Chewning and William D. Chewning, 926 W. Hanna St., Denison, Texas, have combined to produce many fine models, one of which occupies our No. 3 spot this month. Brother Sam built this accurately detailed Blackburn *Shark* with a 36" wingspan, while William takes credit for photographing the model, using a background-retouching trick, as readers will probably note.

Realistic Piper *Cub*, No. 4, is the contribution of Cline Clark, Dothan, Ala., and the work of D. C. Vann, Naval Air Corps veteran of W.W. II, and a gas model vet of five years "service". The *Super Cruiser Cub* is powered by a *Rocket* Class C engine, has a wingspan of 7', carries a 4 lb. load and is reported to be an excellent flier.

Clinton Wells, 31 Homer St., Newton Centre, Mass., submitted No. 5, a striking photo of his *Stratometer* Class C rubber stick model. The ship was entered in three Junior Aviation League contests where its sheet-balsa and multi-spar wing and stabilizer construction enabled it to turn in some fairly good performances. Clinton has experimented with two

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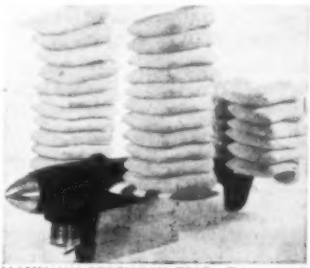

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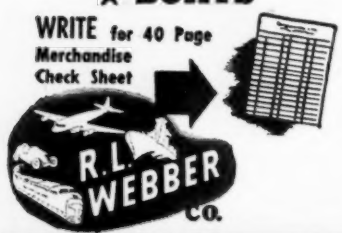

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different props on his *Stratometer*—a 14" two blade folding type, and a 15" Jap Paulo-wina prop with a free wheeler; he found the latter best suited to the model.

No. 6, submitted by Walter Blanck, R.R. 3, Box 248, Indianapolis, Ind., is his first original design. A 75" wingspan combined with an area of 5 sq. ft. and an *Ohlsson 60* to supply power has produced a very stable and efficient flier. Several flights have been weathered without a single mishap.

The beautiful B-17G in No. 7 is the property of Eugene Adams, 2520 Grantwood Dr., Toledo 12, O. who built it to scale for display purposes only. Distinguished by an all-silver finish with black trim, Eugene's model has a 6-1/2' wingspan, movable top, chin and ball turret, and detachable wings. Nose, top turrets and ball were carved from balsa.

TWA's Thomas L. Wardlaw, a veteran pilot, designed the high polyhedral wing monoplane pictured in No. 8 which he calls the *K. C. Terror*. Capt. Wardlaw built this unusual and extremely maneuverable model in his complete basement workshop in North Kansas City, where he spends most of his "off hours" experimenting with new designs. He entered it in the 1946 Nationals at Wichita. The ship has a 62" wingspan, gross weight of 27 oz., and a deep fuselage which gives it a low center of gravity and good stability.

Dwight Norian, 801 85th St., North Bergen, N.J., contributed No. 9, a flying scale B-26 which he constructed from self-made plans drawn up from a few three views and pictures of the big ship. Extra-curricular activities at school forced Dwight to relegate model work to second place so his rubber powered job consumed 2-1/2 years of building time. Wingspread of the B-26 measures 43".

A 65 mph controliner is presented in No. 10, built by John J. Borzner, 414 Seeley Rd., Syracuse 3, N.Y. An extremely smooth-running *Rogers 29* powers this design; and John is proud of his wiring system which, with the exception of the batteries, is hooked up to the engine mount in front of the firewall (visible in photo). There is no electric lead over 4" long; batteries are directly behind the firewall and can be pulled out on the motor mount unit, making the engine interchangeable in several planes. John nightflies his model and for this purpose used a flashlight reflector and bulb mounted beneath the cockpit (switch can be seen in picture). This procedure was discontinued, however, since the added weight of the attachment was not equal to the light output.

No. 11 is the original design of George Struman, 2736 Smith, Hamtramck 11, Mich. George made a changeover from a Gee-Bee circular crossection, whose large dimensions he disliked, to an oval type; first test flight was disappointing because his ship's small wing area wasn't sufficient to lift its 2 lb. weight—hence the monoplane became a biplane. One of the model's features is a completely removable motor unit, including batteries. Other data: wingspan, 25"; fuselage, 21"; power, *Rocket;* color, medium blue, red and yellow trim; weight with additional wing, 2-1/2 lbs.

NEWS OF MODELERS

R. F. Thomas requests a place on *News of Modelers* list of "correspondents available" in England. American model fans may contact him at 40 Wesley Grove, Copnor, Portsmouth, Hants.

Attention, *Atlantic City Cloud Chasers* members! Robert Paul Greenbaum, 252

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Summit Ave., Buffalo 14, N.Y., a visitor to your club last summer, would like to hear from a *Cloud Chaser* who is Bob's age (15 years).

We received a request from Edward Soltis, well known champion of the model hobby and member of the *Yonkers Gas Birds*, to round up a flock of correspondents for him. Ed enjoys writing to his fellow-modelers and we are sure that M.A.N. readers who follow through on this request will enjoy comparing notes with such an experienced hobbyist. You may write to Ed at: 57 Morningside Ave., Yonkers 3, N. Y.

CLUB NEWS

California

The Fresno Gas Model Airplane Club lists its point standings for November:

Class A—1. H. Vincent, 750; 2. F. Mosier, 460; 3. R. Beggs, 291
Class B—1. M. Martin, 690; 2. R. Balekian, 651; 3. H. Vincent, 620
Class C—1. R. Mower, 470; 2. R. Farrar, 271; 3. M. Martin, 270

The F.G.M.A.C. News tallied results for the club's monthly free flight and U-control contests thus:

Free Flight
Class A—1. H. Vincent; 2. B. Behunin; 3. R. Mosier
Class B—1. M. Martin; 2. R. Balekian; 3. H. Vincent
Class C—1. M. Martin; 2. A. Kleinsasser; 3. C. Garabedian
Juniors—1. H. Vincent; 2. R. Balekian; 3. B. Behunin
U-Control
Class A-B—1. Gene Webster; 2. Francis Marshall; 3. Loyal Savaria
Class C—1. Oral Winfrey; 2. Doug Roberts; 3 Don Hangola
Precision—1. Gene Webster

SPONSORED by the Pacific Beach Chamber of Commerce to provide funds for erection of a hospital in the Mission Bay area, the Pacific Beach Airplane & Miniature Car Meet attracted a host of aeromodelers on Dec. 30, 31 and Jan. 1. A.M.A.-sanctioned events included: Class A, B & C, individual stunts, flying scale and team stunts.

DECEMBER was a busy month for the model airplane division of the San Francisco Recreation Dept. A Christmas vacation handlaunched glider contest was held in Balboa Park on Dec. 20, limited to micro and junior glider classifications. Dec. 27 was meet day for original design Class B towline glider owners who flew their models at Balboa Park in events which were open to micro and junior members only. Purpose of this contest was the development of new Class B towline glider designs and the establishing of club records for this event.

DECEMBER'S issue of the *Aeroneer* scheduled southern California's 1947 meet program as follows:

April 13—San Diego Free Flight
April 27—Bakersfield Free Flight
May 4—Los Angeles U-Control
May 11—San Bernardino Free Flight
May 25—Fresno Free Flight
June 8—Los Angeles Free Flight
June 22—E.B.A.A. Free Flight
Sept. 28—E.B.A.A. Free Flight
October 12—Los Angeles U-Control
December 7—Los Angeles Free Flight

The *East Bay Aeroneers Assn.* has proposed these events for inclusion in forthcoming state eliminations:

Indoor
H. L. Gliders, Stick H. L., Cabin R. O. G.
Outdoor
Combination Rubber Stick or Cabin
Wakefield Cabin Model
Towline Gliders
Free Flight Gas Model, 3 classes—A, B, C
Radio Control
Control Line Speed, 3 classes
Control Line Stunt, 3 classes
Flying Scale, Rubber F-F or Control Model (must make qualifying flight of at least 30 sec.)

A November contest at Petaluma sponsored by the *Do Little Flyers* and the

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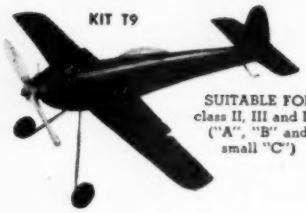

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Lion's Club was limited to modelers residing in the four North Bay counties of Marin, Sonoma, Napa and Solano and listed these winners and follow-ups:

Junior Speed
Class B—1. Vernon Edington
Class C—1. Tom Frazer; 2. Royce Van Bebber
Senior Speed
Class B—1. Blair Mitchell; 2. Gene Ageno
Class C—1. Bob Dollar; 2. L. S. Cooke
Junior Precision
Class B—1. Snuffy Duffy; 2. Don Butman
Class C—1. Snuffy Duffy; 2. LeRoy Green
Senior Precision
Class A—1. Harry Green
Class B—1. Harry Green; 2. Bob Duffy
Class C—1. F. S. Bradford; 2. W. L. Blue
Novelty—1. Snuffy Duffy; 2. Henry Otani
Appearance—1. Ray Sullivan

JUNE and Jack Dyer's *Aeroneer* gives a big hand to the *Palo Alto U-Liners* for the efficiency with which the club, with the cooperation of Palo Alto Recreation Dept., staged its November contest. Results:

Speed
Class A—1. Mal Anderson; 2. Herbert Fensin
Class B—1. Don Ruark; 2. W. E. Richards; 3. Mal Anderson
Class C—1. Chas. Mathews; 2. Maj. C. Field; 3. Al Clarke
Precision
Class A—1. W. S. Biscay; 2. C. L. Bussard; 3. A. Zugnoni
Class B—1. Roy Mayes; 2. Jack Douglas; 3. Ray Regalia
Class C—1. Jalmer Swenson; 2. Alfred Bazurto; 3. E. A. Kroll
Novelty—1. Howard Yonkers; 2. Ray Spinelli; 3. Billy Peden
Junior
Class A—Norman Benner; Class B—Glen Nickell
Class C—Warner Tooker

Connecticut

Off to a good start with a roster of 57 active members, the *Milford Indians Flying Club* of Milford is A.M.A.-chartered and devotes most of its flying time to G-line and U-control, due to limited space. The *Indians* have the use of a good field for control flying and occasionally welcome handlaunched gliders or small rubber jobs "to break the monotony of hot gas buggies and the smell of souped-up fuel."

Officers are: Bob Griswold, Pres.; Bill Hutchinson, Vice Pres.; Jeanne Smith, Secy. Meetings are held in the Milford Model Shop.

Kansas

The *Planesmen*, active member club of the well known Wichita *Hy-Flyers Clubs*, breaks into print with its newspaper, *Plane Tips*. Activities in the offing are election of officers and continuance of well planned programs on club-meeting nights. Recently members sat in on an interesting talk by C. H. Siegfried on the subject of radio controlled models; another meeting featured a discussion by Fred N. Smith, Wichita aeronautical engineer and pilot, on the principles of gliding and soaring and their application to models.

Jim McClelland, A.M.A. contest director with whom Nationals '46 entrants are familiar, recently set a club record for Class A Indoor Handlaunched Open Gliders with a 28.2 sec. run.

The Mid States Model Aeronautical Assn. meeting in Kansas City, Mo., Jan. 4 and 5, was one of great importance to the modeling program in this area, and *Hy-Flyer* leaders turned out in full force to represent Wichita modelers.

Winners of U-Control at El Paso International Aviation Celebration. Lef to right: Joe Kitchens, Babe Dunning, Don Hogan, S. L. Allen. Hogan is a native Texan while the other winners are from California

Minnesota

Invitations were extended recently by the program committee of *St. Paul Modeleers Aero Club* to members and parents to attend Annual Parents' Night. Arthur M. Brown, famous action movie photographer, showed his technicolor movies of model air meets, and Rolland Dexter demonstrated indoor microfilm building and flying.

Mississippi

Reorganized a few months ago by prewar members, the *Jackson Model Airplane Club* recently elected officers for the coming year: Charles Hudspeth, Pres.; Joe Huggins, Vice Pres.; Ted Brister, Secy.; Bill Kennington, Treas.

New Jersey

Elizabeth's Exchange Club held the sponsorship reins at the Model Airplane Flying Carnival on Sunday, Dec. 29 at Elastic Stop Nut Field in Union. A.M.A. rulings governed decisions in these events: U-control Speed, Stunt, and Scale; Jet Planes Speed; Powered Ice-

boats. Winners and follow-ups shared in a $2000 prize award list.

New York

Plans are underway for the *Schenectady Aeroneers'* 8th annual regional model meet on May 25 at the spacious Schenectady County Airport. The program will be made up of these A.M.A.-sanctioned events: Handlaunched and Towline Glider; Cabin and Stick Rubber; Classes A, B & C Free Flight; Classes A, B & C Control Line; Stunt and Speed.

North Dakota

The Fargo-Moorhead squadron of Civil Air Patrol sponsored a model airplane display contest at Fargo on Dec. 10 which attracted a host of entrants and offered a good prize lineup, thanks to C.A.U. and the Davidson Bike Shop. Participants are all in accord that this will be an annual event and have shaped up their modeling program to include a flying contest in June. Winners of the display contest prizes were:

Grand Championship—Phillip Benedict
Fabric Gas Models—1. Phillip Benedict; 2. John Ulteig; 3. Harry Panchott
Rubber—1. James Olson; 2. Don Lynne; 3. Erwin Samuelson
Planked Gas Models—1. Dwain Belcher; 2. Peter Tennofs; 3. Gary Kurowski
Solid Scale—1. James Swanson; 2. Jackie Davidson

Oregon

Ronald Putman writes us that he and a group of modelers in Coos Bay are interested in forming a club to succeed a gas model organization, the *Coos Bay Rib Wreckers*, which was in existence several years ago.

INCORPORATED in a little paper which sketched amusing on-the-scene aspects of a model meet were results of the Tri-Club Contest (Portland *Gas Hoppers*, Salem *Cloud Chasers*, Salem *Model Airplane Club*):

Senior
Class A—1. Rex Baumgardner; 2. Jerry De Berry 3. Owen Brown
Class B—1. Bud Stevenson; 2. Elmer Roth 3. Owen Brown
Class C—1. Jerry De Berry; 2. Earl Cayton 3. Elmer Roth

Junior
Class A—1. Rex Bently; 2. M. Smart; 3. J. Feux
Class B—1. P. Keefer; 2. B. Hammond; 3. Ryder
Class C—1. Tim Kingston; 2. Bob Hammond 3. G. Graber

Pennsylvania

Regular weekly meetings of the *Hazleton Flying Gremlins* are held in the local hobby shop whose proprietor is president of the club. At a recent meeting these new officers were elected: J. J. Linderman, Pres.; H. Minnig, Vice Pres.; S. Osmanski, Secy.; W. Muir, Treas. 34 members comprise the *Gremlins*, most of them newcomers to the modeling hobby. Most heated subject of discussion at present is the establishment of a good point system. Secretary Stanley Osmanski asks that readers of "Club News" compare the *Gremlins'* work to date on this subject with their own club regulations and send along any ideas to Stanley at 324 W. Green St., W. Hazleton, Penna.:

25 pts. for building of new gas model, U-control or free flight
1 pt. for attendance at meetings
1 pt. for going to airport
1 pt. for attending out-of-town contests
1 pt. for each flight over 40 sec. duration in free flight

Texas

The International Aviation Celebration's model meet, announced in January "Club News", was run off on Dec. 14 & 15 as scheduled, conducted by *El Paso Miniature Motor Club* and sponsored by El Paso Chamber of Commerce. The

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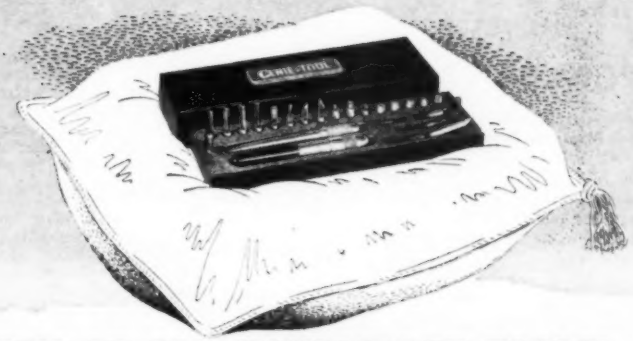

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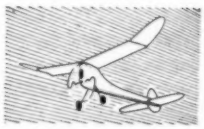

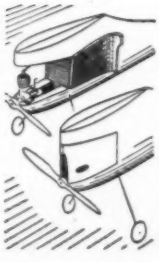

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show, held under perfect weather conditions at the Municipal Airport, attracted 70 entrants and 10,000 spectators. Results:

Speed
Class A—1. Charles Bowman
Class C—1. Babe Dunning; 2. Joe Kitchens 3. S. L. Allen
Junior Stunt—1. Carlos Terrazas; 2. Ed Solguero 3. Charles Uchtman
Senior Stunt—1. Frank Abel; 2. Don Hogan 3. Lassie Barksdale, Jr.
Scale—1. Gordon "Bugs" Brock
Grand Prize winners—E. C. Ward and Louis Wiegel

Mexico

Manuel Tirado Tapia, president of the Mexican Wing of Escuadrilla Inter-Americana, wrote us in December of his group's plans for a model meet in Calle de Lopez on Dec. 8. Mr. Tapia, who has headed his club since the end of the war in an earnest effort to stimulate interest and progress in modeling, believes that this program (which included events for gas models, alloy metal gliders and solid models) was a step in the right direction. Mexican Air Force officials, representatives of the Office of Coordinator of Inter-American Affairs and the Mexican School of Aviation attended the festivities. "Club News" will publish results in a future issue.

England

The Leicester section of *Association of British Aeromodellers* held its Annual General Meeting recently and appointed the following committee for 1947 to represent the A.B.A. in England's model activity: Mr. Greaves, Chairman; Mr. Pollard, Secy.; Mr. Roy Gunn, Council Representative; Messrs. Davison, Pegasus, and Hazell, Members.

Newsletter

(*Continued from page* 10)

OLD-TIMERS and ex-members of the International Gas Model Airplane Association (established by MODEL AIRPLANE NEWS) will recall genial Herb Greenberg, a top notch entrant of the early Nationals. Well, we heard from Herb not long ago and pass along info on his present work. He is an inspection test pilot with the Naval Base aircraft plant in Philadelphia and for the past 18 months has been working on PBY-5A's, B-17's, F6F's, F8F's and a flock of new jobs about which he cannot talk. So it's Lieut. Greenberg USNR now, and he confesses he's about to complete a free flight job he has been working on—off and on, that is—for the past 6 years!

* * *

WHILE we're on the subject of old-timers, many readers will recall Maxwell Bassett, the lad who walked off with all the outdoor awards at an early *National* contest because he was flying the first gas engine powered model against rubber entries. Well, Maxwell is the chap most responsible for the new Martin twin-engine airliner, the 202.

JOHNNY YOUNG, once of the famed *New York Aeronuts Club*, has been doing

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1 16x1 16	$.20	$ 1.80
1 16x1 8	.34	3.20
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1 16x1 4	.65	5.00
1 16x3/8	.75	7.25
3 32x3/32	.25	2.25
3 32x3/16	.45	4.25
3 32x1 4	.58	5.35
3 32x3/8	.90	8.50
3 32x1 2	1.20	11.00
1 8 x1 8	.40	3.50
1 8 x3 16	.65	5.50
1 8 x1 4	.85	7.50
1 8 x3 8	1.20	10.50
1 8 x1 2	1.70	14.00
3 16x3/16	.85	6.75
3 16x1 4	1.00	8.00
3 16x3 8	1.45	13.00
3 16x1 2	1.80	16.00
3 16x5 8	2.30	20.00
1 4 x1 4	1.20	10.00
1 4 x3 8	1.75	15.00
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contract aeronautical engineering work in Hagerstown, Md. Now he is returning to the model field in a quiet way with several new accessory gadgets.

JOHN P. GLASS, the model genius to top all aeromodeling genii, after an exciting wartime career as a Sperry trouble-shooter has opened a machine shop near Philadelphia. John was the first to predict the possibilities of a 30 minute indoor flight and introduced tungsten wire as bracing material for fragile indoor jobs.

ANOTHER piece of good news is that Frank Zaic (mentioned earlier in this ditty) is going to bring out a compilation of the best of his famous series of "model aeronautics yearbooks." New modelers have missed much if they have not had the privilege of pouring over a Zaic manual.

* * *

NOT LONG AGO we had a pathetic note from Lakeview, Wash., modeler who had been refused admittance to membership in the *Tacoma Aeromudlers*. Rank discrimination, we roared—and then we read farther.

"I am signed up with the AMA as a licensed flyer," wrote licensee No. 26503, "but still am not welcomed as a model builder by the *Aeromudlers*. I have flown against the boys of the club in out-of-town contests and invitational or open meets in town, but am not allowed to fly in the club contests so am left out on local points and prizes."

How do you like that? But then came the explanation.

"Their only objection is that I am a *girl*. I am perfectly willing to sacrifice the 10 points given for club attendance and leave the meeting 'stag' affairs if I can fly in club contests." (Signed, Skippy Witt.)

Now just between us, we think the *Aeromudlers* are scared of being whipped by Miss Witt! More power to you, Skippy; we hope you wear the boys down and get them to establish a ladies' auxiliary!

* * *

DID YOU ever have a hankering to build model airplanes or test them—and get paid for it? Well, lots of model builders have been doing that for years. They are employed as "Under Model Aircraft Makers" by the government's aeronautical testing laboratories, the National Advisory Committee for Aeronautics.

We checked recently with Permely C. Daniels, personnel officer for NACA regarding the possibilities for future employment of model builders. He revealed that the Committee "has intermittent need for highly qualified personnel and invite your cooperation in referring applicants either to the NACA offices in Washington, D.C., at 1500 New Hampshire Ave., N.W., or directly to one of the laboratories."

If you desire such employment and live near one of the labs you can make inquiries of Personnel Officer, NACA, Langley Field, Va.; Personnel Officer, NACA, Cleveland, Ohio; or Administrative Officer, NACA, Moffet Field, Calif. Positions are regular civil service ratings with automatic advancements and salary increases to those who do good work.

* * *

If you're an old model builder you've probably been using balsa wood for years, but do you know what the name means? We ran down some information on this with the cooperation of balsamagnate Prem Gary of Jersey City, N.J. We found that balsa is known locally by a variety of names according to location. Its common names generally refer to its various properties of appearance. In fact, the word "balsa" itself means "raft" in Spanish. In Ecuador it is known as Boya, meaning buoy.

In some sections of Central and South America it is known as "cork wood" or "down tree," after the downy hairs in which the seed is embedded. In Haiti it is known as "bois flot," for its flotation qualities, or "patte de lievre" from the appearance of its fruit to a rabbit's foot, due to the furry down appearing through the long seed pod. Other names are "bombast mahoe," "dum," "guano," "ceibon botija," "lanero," "gonote real," "maho," "mo-mah," "polak," "lanilla," "puh," "tambor," "algondon" (meaning cotton), "gatillo," and others. Its scientific name is "Ochroma lagopus."

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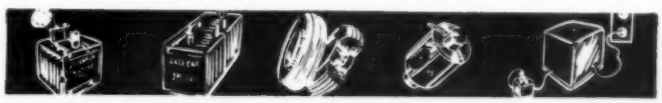

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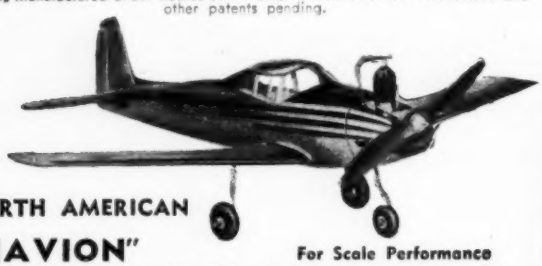

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Cessna "140"	$1.50
Interstate Cadet	1.50
Folkert's Racer	1.50
	1.50

DURATION

Flying Cloud	$1.50

GLIDERS

Sinbad "40"	
Sinbad the Sailer	$ .65
Super Sinbad	1.25
	2.50

AT BETTER DEALERS EVERYWHERE

BERKELEY MODELS INC.

BROOKLYN 22, N. Y.

THIS MONTH'S ACE FEATURES

All These Items in Stock for Immediate Shipment

ACE MODEL AIRPLANE CO.

3149 Shenandoah, St. Louis 4, Mo.

The Nation's Oldest Hobby House

Offering a Complete Parts Stock and All Model Motors

Pat Morrisey says: "At ACE Your Order Gets Attention Right Now"

The New ARDEN Class "A" MOTOR

$18.50 Postpaid

Less Coil & Condenser

Arden Motor with Ball Bearing, $21.50

It weighs only 2¼ ounces, but it's packed with power that will thrill you, and make your favorite model a "best" performer. .099 cubic inch displacement. Dependable and easy starting. Arden 199 BB. Motor $25.50. Arden Coil $2.50. Arden Condenser 25c.

TESTOR C-54

$2.50

Complete with Cement, Finishing Materials, Decals, Propeller Discs, and Mounting Stand

By MAIL **$2.65**

Burgess Deluxe VIBRO-TOOL

For fast work of fine quality. Wood carving, plastic engraving, leather tooling, metal embossing, cardboard slicing, steel etching. Marks all metals, glass, plastics, ceramics, wood.

Complete with all attachments except Diamond Point—**$16.50**. Diamond Point **$5.95** additional. Add 25c for postage.

Burgess Standard Vibro Tool, $7.50

DREMEL MOTO TOOL

#2 Moto Tool complete with chuck and one 1/8 Collet and one emery wheel point only $16.50.

Moto Tool complete with one 1/8 collet, one hardwood case, 4 emery wheel points, one dressing stone, 8 carving cutters, 1 saw, 3 bristle brushes, 1 steel brush for cleaning metals, 1 screw mandrel with sanding discs, 1 shoulder mandrel, one 1/2" drum sander, one 3/32 collet, and one 1/16 collet. Complete only $23.50.

The Super "B"

Bore .....11/16"
Stroke .....⅝"
H.P. .....⅛
Displacement 232
Weight (Bare) 5½ oz.

$18.00 with C&C

Cleveland's

7-FT. "STINSON RELIANT"

Favorite for Radio Control!

Builds up and flies like a real plane. 2" scale. Span 82½ inches. Can carry up to 5 lbs. of equipment. Complete, less motor **$15**

Zipper	$5.95	Tarpon	10.75
Whizzer	9.95	Buzz	8.95
G13	7.95	Challenger	9.50
Cyclone	4.95	Cub Trainer	4.95
Fireball	10.00	Strato Streak	2.50
Banshee	6.95	Brigadier 38	1.95
Wanderer	3.50	Runt	2.50
Super Cruiser	10.95	Ercoupe	7.50
Skycycle	7.50	Sailplane	6.95
Hellespont	8.50	Vagabond	5.50
POQ	5.00	Zomby	3.00
Pacer C	4.95	Ranger	3.00
Playboy Baby, Jr. & Sr.	$1. 2.50	Aero Champ	2.50
		Interceptor	3.95
Dreamer	7.50	Falcon Speedster	5.45
Strato Cat	5.95	Baby Miss Behave	2.95
Strato Kitten	2.95	Miss Behave	3.95
Cliffs Trainer	3.50	Champion	2.95
Tether Streak	3.50		

Add 25c Postage

VIVELL SUPER 35

Less Coil, Condenser

$18.00

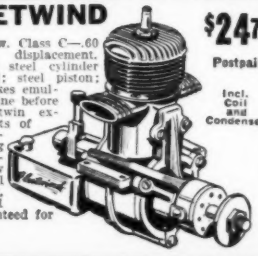
A small Class C motor for Class C or large Class B free flight planes. Ideal for U-control.

FLEETWIND

$24.75 Postpaid

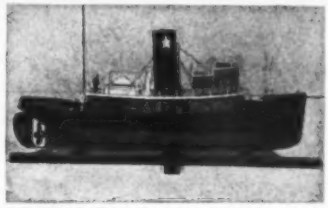
Incl. Coil and Condenser

Brand new. Class C—.60 cu. in. displacement. Hardened steel cylinder and head; steel piston; twin intakes emulsify gasoline before mixing; twin exhaust ports of special design; long life bearings; new type metal gas tank, capacity 1 oz. Guaranteed for 60 days.



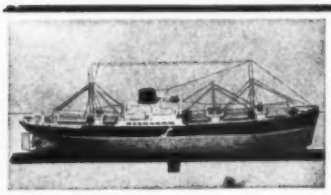
ACE MODEL AIRPLANE CO.

3149 Shenandoah, St. Louis 4, Mo.



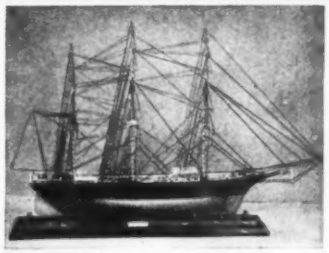
TUG BOAT (Typical) A beautiful model. Scale ⅛". Length, 13"; Height, 11". Complete with fittings $7.50.

Ideal Tug Boat **$3.50**



CAPE MENDOCINO An exceptionally accurate reproduction. 1/16" scale. 26" Long and 8½" High. Complete with fittings

$21.00



SEA WITCH ⅛" scale. Completed model is 36" Long and 24" High. Precision shaped and hollowed hull. Complete with all deck and spar materials

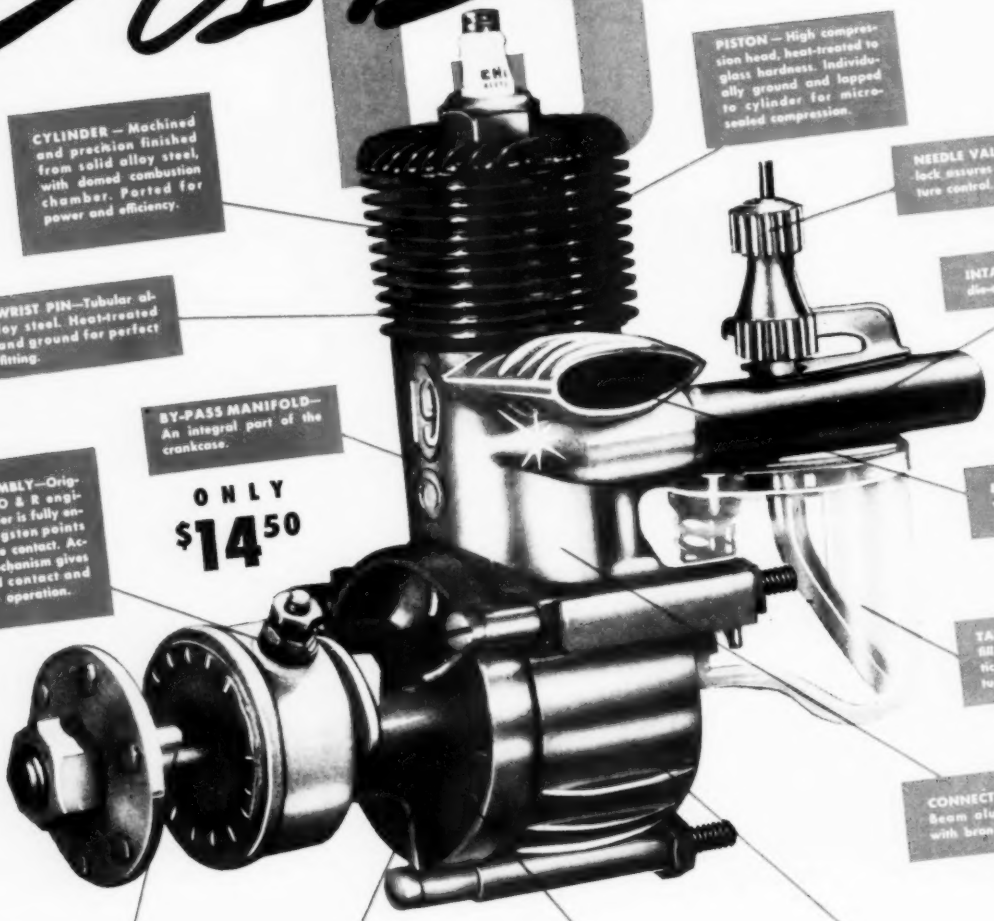
$29.75

CONSTITUTION "OLD IRONSIDES"

Beautiful model; graceful hull. Very interesting rigging, including carving on quarter galleries. 3/32" scale. Finished model is 30" Long; 24" High. Complete with fittings

$32.50

It's Back!



CYLINDER — Machined and precision finished from solid alloy steel, with domed combustion chamber. Ported for power and efficiency.

WRIST PIN—Tubular alloy steel. Heat-treated and ground for perfect fitting.

BY-PASS MANIFOLD—An integral part of the crankcase.

TIMER ASSEMBLY—Originated by O & R engineering. Timer is fully enclosed. Tungsten points and positive contact. Activating mechanism gives prolonged contact and flutter-free operation.

CRANKSHAFT — Machined in one single piece from solid alloy steel. Correctly balanced, heat-treated, hardened and ground.

CRANKCASE — Front section: Aluminum die-cast, recessed and webbed for strength, heat dissipation and distribution of bearing load. Fitted with bronze main bearings.

BALL THRUST BEARING —Eight ground hard steel balls encased in hardened steel races.

CRANKCASE — Rear Section: One-piece aluminum die-cast unit. Designed for either beam or radial mounting.

CONNECTING ROD—"I" Beam aluminum alloy with bronze bushing.

TANK ASSEMBLY—[illegible] fill cap. Transparent [illegible] tic tank with sump [illegible] ture.

EXHAUST PIPE—[illegible] with crankcase.

INTAKE TUBE—Integral [illegible] die-cast with crankcase

NEEDLE VALVE—Positive lock assures perfect mixture control.

PISTON — High compression head, heat-treated to glass hardness. Individually ground and lapped to cylinder for micro-sealed compression.

ONLY **$14.50**

MORE ENGINE FOR THE MONEY

It's back. The engine that revolutionized Class A flying... and gave model builders the biggest dollar's worth ever offered. *Back* at the pre-war price of only $14.50, but it's an even finer, more powerful O & R 19, improved and refined by four years of war-time engineering experience.

Modelers new and old will recognize the 19 as THE engine-buy of 1947. Only a company with the manufacturing facilities and large-volume sales of Ohlsson & Rice could offer such quality at such an extremely moderate price. Get a 1947 19 at your dealer's now—for the biggest value in model engine history. *Pick a 19 and pocket the difference.* Ohlsson & Rice, Inc. Emery at Grande Vista, Los Angeles 23, California.

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